

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION IX

IN THE MATTER OF:
Corona/Twin Peaks Mines Site,
Napa County, California

Tuleyome,

Respondent

CERCLA Docket No. 2018-17

GOOD SAMARITAN SETTLEMENT
AGREEMENT AND ORDER ON
CONSENT FOR REMOVAL ACTION

PURSUANT TO THE
COMPREHENSIVE ENVIRONMENTAL
RESPONSE, COMPENSATION, AND
LIABILITY ACT 42 U.S.C. §§ 9604,
9606, 9607, 9622

I. JURISDICTION AND GENERAL PROVISIONS

1. This Good Samaritan Settlement Agreement and Order on Consent for Removal Action ("Settlement Agreement") is entered into voluntarily by the United States Environmental Protection Agency (EPA) and Tuleyome (hereinafter "Good Samaritan"). This Settlement Agreement provides for the performance of a removal action by Good Samaritan in connection with the Property located in the East Mayacmas Mercury District in Napa County, California. This Settlement Agreement requires Good Samaritan to conduct the removal action described herein to abate the actual or threatened release of hazardous substances, pollutants, or contaminants at or from the Site.

2. This Settlement Agreement is issued pursuant to the authority vested in the President of the United States by Sections 104, 106, 107 and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §§ 9604, 9606, 9607 and 9622, as amended (CERCLA), and delegated to the Administrator of the EPA by Executive Order No. 12580, January 23, 1987, 52 Federal Register 2923, and further delegated to the undersigned Regional official, and the authority of the Attorney General of the United States to compromise and settle claims of the United States.

3. EPA has provided notice of this Settlement Agreement and proposed removal action to the California Regional Water Quality Control Board, Central Valley Region (Regional Board).

4. Good Samaritan's participation in this Settlement Agreement shall not constitute or be construed as an admission of liability, nor of EPA's findings or determinations contained in this Settlement Agreement. Good Samaritan agrees to comply with and be bound by the terms of this Settlement Agreement. Good Samaritan further agrees that it will not contest the basis or validity of this Settlement Agreement or its terms.

5. EPA and Good Samaritan agree that Good Samaritan's performance of the Work at the Property in accordance with this Settlement Agreement will constitute "rendering care or advice" at the Site in accordance with Section 107(d)(1) of CERCLA, 42 U.S.C § 9607(d)(1). In view of the nature and extent of the Work to be performed, however, and the risk of claims being asserted against Good Samaritan for costs or damages notwithstanding Section 107(d)(1) as a consequence of Good Samaritan's activities at the Site pursuant to this Settlement Agreement, one of the purposes of this Settlement Agreement is to resolve, subject to the reservations and limitations contained in Section XVII (United States Reservation of Rights), any potential liability of Good Samaritan under CERCLA for the Existing Contamination at the Site.

6. The resolution of this potential liability, in exchange for Good Samaritan's performance of the Work, is in the public interest.

II. PARTIES BOUND

7. This Settlement Agreement applies to and is binding upon EPA and upon Good Samaritan. Good Samaritan shall ensure that its contractor, subcontractors, and representatives receive a copy of this Settlement Agreement and comply with this Settlement Agreement. Good Samaritan shall be responsible for any noncompliance with this Settlement Agreement.

III. DEFINITIONS

8. Unless otherwise expressly provided herein, terms used in this Settlement Agreement which are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Settlement Agreement or in the appendices attached hereto and incorporated hereunder, the following definitions shall apply:

a. "Effective Date" means the date upon which EPA issues written notice to Good Samaritan that EPA has fully executed the Settlement Agreement after review of and response to any public comments received.

b. "Existing Contamination" means any hazardous substances, pollutants or contaminants present or existing on or under the Property as of the Effective Date; any hazardous substances, pollutants or contaminants that migrated from the Property prior to the Effective Date; and any hazardous substances, pollutants or contaminants presently at the Site that migrate onto or under or from the Property after the Effective Date.

c. "Orphan Mine Site" means an abandoned, inactive hardrock mine or primary metal processing mill site for which, despite reasonable and diligent efforts, no financially viable party (except, for purposes of this Settlement Agreement, the owner of the site who did not cause, contribute to, or exacerbate the Existing Contamination) is potentially liable to perform or pay for, or has been required to perform or pay for, environmental cleanup actions under applicable law.

d. "Parties" means EPA and Good Samaritan.

e. "Property" means that portion of the Site, encompassing approximately 32 acres, and comprised of certain portions of the following Napa County Assessor's Parcel Numbers (APNs): 016-020-020, 016-020-023, 016-020-026, 016-020-027, 016-020-035, 018-010-006, 018-010-007, and 018-010-009. See map and figures at Appendix 1.

f. "Site" means the Property, and all areas to which hazardous substances

and/or pollutants or contaminants that originated on the Property have come to be located, including impacted portions of the James Creek watershed and downstream to Lake Berryessa. See map and figures at Appendix 1.

g. "Work" means all activities Good Samaritan is required to perform under this Settlement Agreement, except those required by Section X (Record Retention, Documentation, and Availability of Information). The Parties acknowledge that all Work performed by Good Samaritan will be in consultation with and at the direction of CTPHA.

IV. FINDINGS OF FACT

9. Good Samaritan is Tuleyome, a non-profit corporation organized under the laws of the State of California. Good Samaritan is voluntarily agreeing, pursuant to this Settlement Agreement, to perform a removal action at an Orphan Mine Site. Good Samaritan did not cause, contribute to, or exacerbate the contamination.

10. Corona/Twin Peaks Historical Association LLC (CTPHA) has owned the Property, as well as surrounding land since 2012. EPA and Good Samaritan have no knowledge or information that CTPHA caused, contributed to, or exacerbated the contamination.

11. Pursuant to Section XXIV, Good Samaritan certifies that it is not an owner or operator, generator, or transporter, or otherwise a liable party for this Site pursuant to CERCLA Sections 106 and 107. Good Samaritan also certifies that it is not a past or current owner of the Property, and that it does not intend to acquire ownership of the Property.

12. The James Creek watershed has been adversely affected by historic mining activity. Mine tailings from inactive or abandoned milling operations and waste rock from the development of the mines are located along and in close proximity to Kidd Creek and Bateman Creek.

13. Kidd Creek is a tributary of James Creek, which is a tributary to Pope Creek. Both Kidd and James Creeks are sources of water used for irrigated agriculture. Pope Creek flows to Lake Berryessa, a sport fishery and source of drinking water about 13 miles downstream from the Site. James Creek is included on California's 303(d) list as impaired for mercury and nickel. Lake Berryessa is included on California's 303(d) list as impaired for mercury.

14. The Site is located near Middletown, California, and is an Orphan Mine Site. Mine waste rock and/or tailings at the Site are being eroded into Kidd Creek and Bateman Creek. These waste rock piles and/or tailings contribute metals such as nickel and mercury to the river, especially during storms. These metals have a harmful effect on water quality and pose risks to human health and the environment.

15. Good Samaritan, in consultation with and at the direction of CTPHA, has been maintaining and enhancing previously installed systems, which were designed to reduce and eliminate adverse water quality impacts resulting from adit drainage. The systems under construction include infiltration trenches, diversion of seasonal surface water flows away from mine waste, use of swales and check dams to slow runoff velocity and minimize sediment transport, grading to control the flow of water and minimize erosion, and planting native cover on exposed surfaces.

16. Good Samaritan, in consultation with and at the direction of CTPHA, has planned and is implementing a pilot study to assess the efficacy of a subsurface chemical amendment

method to substantially reduce the metal loading from the Corona Drain Tunnel. If the pilot study is successful, it would demonstrate that addition of the amendment can prevent mobilization of metals at the source, and therefore prevent contamination from continuing downstream.

17. The actual or threatened release of one or more hazardous substances from the facility may present an imminent and substantial endangerment to the public health or welfare or the environment.

V. CONCLUSIONS OF LAW AND DETERMINATIONS

18. Based on the Findings of Fact set forth above and the Administrative Record supporting this removal action, EPA has determined that:

a. The Corona/Twin Peaks Mines Site is a "facility" as defined by Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

b. Nickel and mercury are "hazardous substances, pollutants or contaminants" as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

c. Good Samaritan is a "person" as defined by Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

d. The conditions described in the Findings of Fact above constitute an actual or threatened "release" of a hazardous substance, pollutant or contaminant from the facility as defined by Section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

e. The Work required by this Settlement Agreement is necessary to protect the public health, welfare, or the environment, and if carried out in compliance with the terms of this Settlement Agreement, will be consistent with the National Contingency Plan (NCP), as provided in Section 300.700(c)(3)(ii) of the NCP.

f. As set forth in the Administrative Record, considering the exigencies of the situation and the limited scope of the removal action to be conducted, EPA has determined that attainment of water quality standards under the Federal Water Pollution Control Act, 33 U.S.C. §§1251, et seq., as a result of the Work is not practicable as provided in 40 CFR § 300.415(j). Given that attainment of water quality standards as a result of the Work is not practicable, Good Samaritan will comply with Section 5 of the Work Plan that addresses water quality issues in order to ensure environmental improvement at the Property.

VI. AGREEMENT

19. Based upon the foregoing Findings of Fact, Conclusions of Law and Determinations, and the Administrative Record for this Site, and in consideration and exchange for the United States' covenant not to sue in Section XVI, it is hereby ordered and agreed that Good Samaritan shall comply with the following provisions, including but not limited to, all attachments to this Settlement Agreement, and all documents incorporated by reference into this Settlement Agreement, and perform the actions specified in Section VIII.

VII. DESIGNATION OF CONTRACTOR, PROJECT COORDINATOR, AND ON-SCENE COORDINATOR

20. EPA has designated Bret Moxley as its On-Scene Coordinator (OSC). Good Samaritan shall direct all submissions required by this Settlement Agreement to Bret Moxley, EPA Region 9, 75 Hawthorne Street (SFD-9-2), San Francisco, CA 94105, Moxley.Bret@epa.gov.

21. Good Samaritan has retained a contractor and subcontractors to perform the Work. Good Samaritan has proposed and EPA has authorized Good Samaritan to proceed with the work. EPA retains the right to disapprove of any or all of the contractors and/or subcontractors retained by Good Samaritan. If EPA disapproves of a selected contractor or subcontractor, Good Samaritan shall retain a different contractor or subcontractor and shall notify EPA of that's contractor's or subcontractor's name, title, contact information, and qualifications within 90 days after EPA's disapproval. The qualifications of the persons undertaking the Work for Good Samaritan shall be subject to EPA's review for verification that such persons meet minimum technical background and experience requirements based on objective assessment criteria (e.g., experience, capacity, technical expertise) and that they do not have a conflict of interest with respect to the project.

22. Not more than ten (10) days after the Effective Date, Good Samaritan shall designate a Project Coordinator who shall be responsible for administration of all Good Samaritan's actions required by the Settlement Agreement. Good Samaritan shall submit the designated Project Coordinator's name, address, telephone number, and qualifications to EPA at the time of designation. To the greatest extent possible, the Project Coordinator shall be present on Site or readily available during Site Work. Receipt by Good Samaritan's Project Coordinator of any notice or communication from EPA relating to this Settlement Agreement shall constitute receipt by Good Samaritan.

23. EPA shall have the right to change its designation of OSC. Good Samaritan shall have the right to change its designated Project Coordinator. Good Samaritan's initial notification of its intention to change its Project Coordinator designation may be orally made but it shall be promptly followed by a written notice.

VIII. WORK TO BE PERFORMED

24. Good Samaritan shall, at a minimum, perform the following activities as more fully described in the Work Plan, Appendix 2, which has been approved by EPA and is incorporated in this Settlement Agreement by reference:

- install a pilot scale system designed to reduce the metal loading from the Corona Drain Tunnel to Kidd Creek;
- consolidate mine waste;
- improve runoff controls;
- enhance revegetation of waste rock and tailings at the Boiler House Adit and Twin Peaks Adit; and
- improve the existing infiltration trenches at the Boiler House Adit and Twin Peaks Adit.

25. Work Plan and Implementation. The OSC may make minor modifications to any plan or schedule in writing or by oral direction. Any oral modification will be memorialized in

writing by EPA promptly, but shall have as its effective date the date of the OSC's oral direction. Any other requirements of this Settlement Agreement may be modified in writing by mutual agreement of the Parties. The Work Plan, the schedule, and any subsequent modifications shall be fully enforceable under this Settlement Agreement. Good Samaritan shall notify EPA at least one week prior to performing any Work at the Corona Drain Portal or otherwise along Kidd Creek.

26. Health and Safety Plan. Good Samaritan certifies that it has developed a Health and Safety Plan that is consistent with EPA's current Standard Operating Safety Guide, and which provides for protection of the public health and safety during performance of on-Site Work under this Settlement Agreement. This Health and Safety Plan is hereby incorporated by reference. See Appendix 3.

27. Quality Assurance and Sampling

a. All sampling and analyses performed pursuant to this Settlement Agreement shall conform to EPA direction, approval, and guidance regarding sampling, quality assurance/quality control (QA/QC), data validation, and chain of custody procedures. Good Samaritan shall ensure that the laboratory used to perform the analyses participates in a QA/QC program that complies with the appropriate provisions of EPA guidance. Good Samaritan certifies that the Quality Assurance Project Plan it has developed is consistent with the following documents, as appropriate: "Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures," "OSWER Directive Number 9360.4-01; and "Environmental Response Team Standard Operating Procedures," OSWER Directive Numbers 9360.4-02 through 9360.4-08."

b. Upon request by EPA, Good Samaritan shall allow EPA or its authorized representatives to take split and/or duplicate samples of any samples collected by Good Samaritan while performing the Work. Good Samaritan shall notify EPA not less than five (5) days in advance of any substantial change to its current sample collection schedule. EPA shall have the right to take any additional samples that it deems necessary.

28. Reporting. Good Samaritan shall submit a written progress report to EPA concerning actions undertaken pursuant to this Settlement Agreement every quarter-year after the Effective Date until submission of the Final Report pursuant to Paragraph 29, unless otherwise directed in writing by the OSC. These reports, which may be submitted via email to the OSC, shall describe all significant developments during the reporting period, including the actions performed and any problems encountered, any analytical data received during the reporting period; and the developments anticipated during the next reporting period, including a schedule of actions to be performed, anticipated problems; and planned resolutions of past or anticipated problems.

29. Final Report. Not more than sixty (60) days after completion of all Work required under this Settlement Agreement, Good Samaritan shall submit for EPA review and approval a final report summarizing the actions taken to comply with this Settlement Agreement. The final report shall conform, at a minimum, to the requirements set forth in 40 CFR § 300.165 of the NCP entitled "OSC Reports." The final report shall include a good faith estimate of total costs or a statement of actual costs incurred in complying with the Settlement Agreement, a listing of quantities and types of materials removed off-Site or handled on-Site, a discussion of

removal and disposal options considered for those materials, a listing of the ultimate destination of those materials, a presentation of the analytical results of all sampling and analyses performed, and accompanying appendices containing all relevant documentation generated during the Work (e.g., manifests, invoices, bills, contracts, and permits). The final report shall also include the following certification signed by a person who supervised or directed the preparation of that report:

Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate, and complete.

30. **Off-Site Shipments.** All hazardous substances, pollutants or contaminants removed off-Site pursuant to this Settlement Agreement for treatment, storage, or disposal shall be treated, stored, or disposed of at a facility in compliance with, as determined by EPA, 42 U.S.C. § 9621(d)(3), and the off-site provisions found at 40 CFR § 300.440, and all applicable laws and regulations. Good Samaritan will provide EPA with prior notification of any out-of-state waste shipments.

IX. SITE ACCESS

31. Good Samaritan shall use its best efforts to obtain and maintain all necessary access agreements for Good Samaritan, as well as for the United States on behalf of EPA and its representatives (including contractors), for the purpose of conducting any activity related to this Settlement Agreement. Good Samaritan shall immediately notify EPA if after using its best efforts it is unable to obtain such agreements. For purposes of this Paragraph, "best efforts" includes the payment of reasonable sums of money in consideration of access. Good Samaritan shall describe in writing its efforts to obtain access. EPA may then assist Good Samaritan in gaining access, to the extent necessary to effectuate the Work described herein, using such means as EPA deems appropriate.

X. RECORD RETENTION, DOCUMENTATION, AND AVAILABILITY OF INFORMATION

32. Good Samaritan shall preserve all documents and information relating to the Work, or relating to the hazardous substances, pollutants or contaminants found on or released from the Site, and submit them to EPA upon completion of the Work.

33. Good Samaritan may assert a business confidentiality claim pursuant to 40 CFR § 2.203(b) with respect to part or all of any information submitted to EPA pursuant to this Settlement Agreement, provided such claim is allowed by Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7). Analytical and other data specified in Section 104(e)(7)(F) of CERCLA shall not be claimed as confidential by Good Samaritan. EPA shall disclose information covered by a business confidentiality claim only to the extent permitted by, and by means of the procedures set forth at, 40 CFR Part 2 Subpart B. If no such claim accompanies the information when it is received by EPA, EPA may make it available to the public without further notice to Good Samaritan.

XI. COMPLIANCE WITH OTHER LAWS

34. Except as provided below, Good Samaritan shall perform all actions required pursuant to this Settlement Agreement in accordance with all applicable local, state, and federal laws and regulations except as provided in CERCLA § 121(e) and 40 CFR §§ 300.400(e) and

300.415(j). In accordance with 40 CFR § 300.415(j), all on-Site actions required pursuant to this Settlement Agreement shall, to the extent practicable, as determined by EPA, considering the exigencies of the situation, attain applicable or relevant and appropriate requirements (ARARs) under federal environmental or state environmental or facility siting laws. As set forth in Paragraph 18(f) and documented in the Administrative Record, EPA has determined that attainment of water quality standards under the Federal Water Pollution Control Act, 33 U.S.C. 1251, et seq., as a result of the Work is not practicable. 40 CFR § 300.415(j). Good Samaritan will comply with Section 5 of the Work Plan that addresses water quality issues in order to ensure environmental improvement at the Property.

XII. EMERGENCY RESPONSE AND NOTIFICATION OF RELEASES

35. In the event of any action or occurrence during performance of the Work which causes or threatens a release of a hazardous substance from the Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Good Samaritan shall immediately take all appropriate action. Good Samaritan shall take these actions in accordance with all applicable provisions of this Settlement Agreement, including, but not limited to, the Health and Safety Plan, in order to prevent, abate or minimize such release or endangerment caused or threatened by the release. Good Samaritan shall also immediately notify the OSC or, in the event of his/her unavailability, shall notify the Emergency Response Branch of the incident or Site conditions.

36. In addition, in the event of any release of a hazardous substance from the Site resulting from the actions conducted pursuant to this Settlement Agreement, Good Samaritan shall immediately notify EPA's OSC, Bret Moxley, at (415) 972-3114 or (415) 971-7720 and the National Response Center at telephone number (800) 424-8802. Good Samaritan shall submit a written report to EPA within seven (7) days after such release, setting forth the events that occurred and the measures taken or to be taken to mitigate any release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release. EPA reserves the right to take appropriate measures to mitigate the risk of or potential impact from a threatened or actual release.

XIII. AUTHORITY OF THE EPA ON-SCENE COORDINATOR

37. The OSC shall be responsible for overseeing Good Samaritan's implementation of this Settlement Agreement. The OSC shall have the authority vested in an OSC by the NCP, including the authority to halt, conduct, or direct the Work, or to direct any other removal action undertaken at the Site. Absence of the OSC from the Site shall not be cause for stoppage of the Work unless specifically directed by the OSC.

XIV. DISPUTE RESOLUTION

38. The Parties shall attempt to resolve any disagreements concerning this Settlement Agreement expeditiously and informally. To the extent needed, Parties will agree on the selection of a neutral to guide discussions and negotiations consistent with generally accepted mediation/dispute resolution practice. If the Parties are unable to reach an agreement regarding the dispute within a reasonable period, an EPA management official at the Deputy Regional Administrator level or higher will review the dispute and will issue a written decision. EPA's decision shall be incorporated into and become an enforceable part of the Settlement Agreement.

XV. FORCE MAJEURE

39. Good Samaritan agrees to perform all requirements of this Settlement Agreement within the time limits established under this Settlement Agreement, unless the performance is delayed by a *force majeure*. For purposes of this Settlement Agreement, a *force majeure* is defined as any event arising from causes beyond the control of Good Samaritan, or of any entity controlled by Good Samaritan, including but not limited to its contractors and subcontractors, which delays or prevents performance of any obligation under this Settlement Agreement despite Good Samaritan's best efforts to fulfill the obligation. *Force majeure* does not include financial inability to complete the Work or increased cost of performance.

40. If EPA agrees that the delay or anticipated delay is attributable to a *force majeure* event, the time for performance of the obligations under this Settlement Agreement that are affected by the *force majeure* event will be extended by EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the *force majeure* event shall not, of itself, extend the time for performance of any other obligation. If EPA does not agree that the delay or anticipated delay has been or will be caused by a *force majeure* event, EPA will notify Good Samaritan in writing of its decision. If EPA agrees that the delay is attributable to a *force majeure* event, EPA will notify Good Samaritan in writing of the length of the extension, if any, for performance of the obligations affected by the *force majeure* event.

XVI. UNITED STATES COVENANT NOT TO SUE

41. In consideration of the actions that will be performed by Good Samaritan under the terms of this Settlement Agreement, and except as otherwise specifically provided in this Settlement Agreement, the United States covenants not to sue or to take administrative action against Good Samaritan pursuant to Sections 106 and 107(a) of CERCLA, 42 U.S.C. §§ 9606 and 9607(a), for Existing Contamination. This covenant not to sue shall take effect upon the Effective Date and is conditioned upon the complete and satisfactory performance by Good Samaritan of all obligations under this Settlement Agreement. This covenant not to sue extends only to Good Samaritan and does not extend to any other person.

XVII. UNITED STATES RESERVATION OF RIGHTS

42. Except as specifically provided in this Settlement Agreement, nothing herein shall limit the power and authority of EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants or contaminants, or hazardous or solid waste on, at, or from the Site. Further, nothing herein shall prevent EPA from seeking any legal or equitable relief necessary to enforce the terms of this Settlement Agreement.

43. The covenant not to sue set forth in Section XVI above does not pertain to any matters other than those expressly identified therein. The scope of the reservations in this Section is premised on the voluntary nature and narrow scope of the actions to be undertaken pursuant to this Order, the fact that Good Samaritan does not currently own the Property, and on Good Samaritan's certification that it does not intend to own such Property in the future. The United States reserves, and this Settlement Agreement is without prejudice to, all rights against Good Samaritan with respect to the following:

- a. liability resulting from exacerbation of Existing Contamination due to

willful, intentional or grossly negligent conduct by Good Samaritan, its successors, contractors, subcontractors, assignees, lessees or sublessees, except to the extent that the conditions constituting or contributing to the exacerbation were disclosed to EPA, or were readily observable by EPA, prior to issuance of the Notice of Completion;

- b. criminal liability;
- c. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;
- d. liability for violations of federal law or regulations; and
- e. liability for releases of hazardous substances within or outside the Site caused by Good Samaritan's activities not within the scope of this Settlement Agreement.

44. Work Takeover.

a. In the event EPA determines that Good Samaritan has ceased implementation of the Work, is seriously or repeatedly deficient or late in its performance of the Work, or is implementing the Work in a manner which may cause an endangerment to human health or the environment, EPA may assume the performance of all or any portion of the Work as EPA determines necessary. Prior to taking over the Work, EPA will issue a written notice to Good Samaritan specifying the grounds upon which such notice was issued and providing Good Samaritan with thirty (30) days within which to remedy the circumstances giving rise to EPA's issuance of such notice.

b. Good Samaritan may invoke dispute resolution set forth in Section XIV to dispute EPA's determination that takeover of the Work is necessary. However, notwithstanding Good Samaritan's invocation of such dispute resolution procedures, and during the pendency of any such dispute, EPA may in its sole discretion commence and continue a Work Takeover until the earlier of the date (i) the Parties agree to a resolution of the dispute, or (ii) EPA management renders a written decision.

XVIII. GOOD SAMARITAN'S COVENANT NOT TO SUE

45. Except as otherwise specifically provided in this Settlement Agreement, Good Samaritan covenants not to sue or assert any claim or cause of action against the United States, or its contractors or employees, with respect to the Work, this Settlement Agreement, or Existing Contamination, including but not limited to, any direct or indirect claim for reimbursement from the Hazardous Substance Superfund established by 26 U.S.C. § 9507, based on Sections 106(b)(2), 107, 111, 112, or 113 of CERCLA, 42 U.S.C. §§ 9606(b)(2), 9607, 9611, 9612, or 9613, or any other provision of law.

XIX. OTHER CLAIMS

46. By issuance of this Settlement Agreement, the United States and EPA assume no liability for injuries or damages to persons or property resulting from any acts or omissions of Good Samaritan. The United States or EPA shall not be deemed a party to any contract entered into by Good Samaritan or its directors, officers, employees, agents, successors, representatives, assigns, contractors, or consultants in carrying out actions pursuant to this Settlement Agreement. Except as expressly provided in Section XVI (Covenant Not To Sue), nothing in this Settlement Agreement constitutes a satisfaction of or release from any claim or cause of action against Good Samaritan or any person not a party to this Settlement Agreement, for any liability

such person may have under CERCLA, other statutes, or the common law, including but not limited to any claims of the United States for costs, damages and interest under Sections 106(a) and 107(a) of CERCLA, 42 U.S.C. §§ 9606(a) and 9607(a).

47. This Settlement Agreement does not constitute a preauthorization of funds under Section 111(a)(2) of CERCLA, 42 U.S.C. § 9611(a)(2). Good Samaritan waive(s) any claim to payment under Sections 106(b), 111, and 112 of CERCLA, 42 U.S.C. § 9606(b), 9611, and 9612, against the United States or the Hazardous Substance Superfund arising out of any action performed under this Settlement Agreement.

48. No action or decision by EPA pursuant to this Settlement Agreement shall give rise to any right of judicial review except as set forth in Section 113(h) of CERCLA, 42 U.S.C. § 9613(h).

49. Good Samaritan is carrying out this agreement for its own benefit and waives all claims for compensation for services rendered to EPA for activities it performs in furtherance of this Settlement Agreement.

XX. CONTRIBUTION

50. In the event of a suit or claim for contribution brought against Good Samaritan notwithstanding the provisions of Section 107(d)(1) of CERCLA, 42 U.S.C. § 9607(d)(1), with respect to Existing Contamination (including any claim based on the contention that Good Samaritan is not a person rendering care, assistance, or advice pursuant to Section 107(d)(1), or is no longer entitled to protection from liability pursuant to CERCLA Section 107(d)(1)) as a result of response actions taken in compliance with this Settlement Agreement or at the direction of the OSC), the Parties agree that this Settlement Agreement shall then constitute an administrative settlement pursuant to which Good Samaritan has, as of the Effective Date, resolved liability to the United States within the meaning of Section 113(f)(2) of CERCLA, 42 U.S.C. § 9613(f)(2), and is entitled, as of the Effective Date, to protection from contribution actions or claims as provided by Section 113(f)(2) of CERCLA, or as may be otherwise provided by law, for the "matters addressed" in this Settlement Agreement. The "matters addressed" in this Settlement Agreement are all response actions taken or to be taken and all response costs incurred or to be incurred by the United States or by any other person with respect to Existing Contamination.

51. In the event Good Samaritan were found, in connection with any action or claim it may assert to recover costs incurred or to be incurred with respect to Existing Contamination, not to be a person rendering care, assistance, or advice or acting at the direction of an OSC pursuant to Section 107(d)(1), or to have lost its status as a person rendering care, assistance or advice or acting at the direction of an OSC pursuant to Section 107(d)(1) as a result of response actions taken in compliance with this Settlement Agreement or at the direction of the OSC, the Parties agree that this Settlement Agreement shall then constitute an administrative settlement pursuant to which Good Samaritan has, as of the Effective Date, resolved liability to the United States within the meaning of Section 113(f)(3)(B) of CERCLA, 42 U.S.C. § 9613(f)(3)(B).

52. Good Samaritan agrees that with respect to any suit or claim brought by it for matters related to this Settlement Agreement it will notify the United States in writing no later than sixty (60) days prior to the initiation of such suit or claim.

53. Good Samaritan also agrees that with respect to any suit or claim for contribution brought against it for matters related to this Settlement Agreement it will notify in writing the United States within 14 days of service of the complaint on it.

54. Nothing herein diminishes the right of the United States, pursuant to Section 113(f)(2) and (3) of CERCLA, 42 U.S.C. § 9613(f)(2)-(3), to pursue any person not a party to this Settlement Agreement to obtain response costs or response action and to enter into settlements that give rise to contribution protection pursuant to Section 113(f)(2).

XXI. NOTICE OF COMPLETION

55. When EPA determines, after EPA's review of the Final Report, that all Work has been fully performed in accordance with this Settlement Agreement, EPA will provide notice to Good Samaritan. If EPA determines that any such Work has not been completed in accordance with this Settlement Agreement, EPA will notify Good Samaritan, provide a list of the deficiencies, and require that Good Samaritan modify the Work Plan if appropriate in order to correct such deficiencies. Good Samaritan shall implement the modified and approved Work Plan and shall submit a modified Final Report in accordance with the EPA notice.

XXII. PUBLIC COMMENT

56. This Settlement Agreement shall be subject to a thirty (30)-day public comment period, after which EPA may modify or withdraw its consent to this Settlement Agreement if comments received disclose facts or considerations which indicate that this Settlement Agreement is inappropriate, improper or inadequate.

XXIII. INTEGRATION/APPENDICES

57. This Settlement Agreement, including its appendices, constitutes the final, complete and exclusive agreement and understanding between the Parties with respect to the matters addressed herein. The Parties acknowledge that there are no representations, agreements or understandings relating to the Settlement Agreement other than those expressly contained herein.

58. The following appendices are attached to and incorporated into this Settlement Agreement:

Appendix 1 shall mean map and figures of Site.

Appendix 2 shall mean the Work Plan.

Appendix 3 shall mean the Health and Safety Plan.

XXIV. CERTIFICATIONS

59. By entering into this Settlement Agreement, Good Samaritan hereby certifies that it is rendering care, assistance, or advice in accordance with the National Contingency Plan at the direction of an On-Scene Coordinator, by voluntarily agreeing to clean up Existing Contamination at an Orphan Mine Site, and further that it (a) is not a past owner or current owner of the Property and has no intention of purchasing the Property in the future; (b) is not potentially liable for the remediation of the Existing Contamination pursuant to Sections 106 or 107 of CERCLA; and (c) is not potentially liable under any other Federal, State or local law for the remediation of the Existing Contamination. If the United States determines that any

information provided by Good Samaritan in connection with this Settlement Agreement is not materially accurate and complete, or if Good Samaritan becomes a Site owner or operator in the future, the Settlement Agreement, within the sole discretion of EPA, shall be null and void and EPA reserves all rights it may have.

60. The undersigned representative of Good Samaritan certifies that it is fully authorized to enter into the terms and conditions of this Settlement Agreement and to bind the party it represents to this document.

TULEYOME

BY:

Bret Hewitt, Executive Director
Tuleyome

Date

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

BY:



11-16-2018

Daniel A. Meer, Assistant Director
Superfund Division
Region 9

Date

UNITED STATES DEPARTMENT OF JUSTICE

BY:

Jeffrey Bossert Clark, Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice

Date

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TULEYOME

BY:



Bret Hewitt, Executive Director
Tuleyome

9/25/2018

Date

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

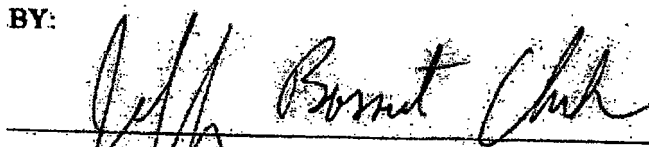
BY:

Daniel Meer, Assistant Director
Emergency Response, Preparedness and Prevention Branch
Region 9

Date:

UNITED STATES DEPARTMENT OF JUSTICE

BY:



Jeffrey Robert Clark, Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice

Date

Jeffrey

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TULEYOME

BY:



9/25/2018

Bret Hewitt, Executive Director
Tuleyome

Date

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

BY:

Daniel Meer, Assistant Director
Emergency Response, Preparedness and Prevention Branch
Region 9

Date

UNITED STATES DEPARTMENT OF JUSTICE

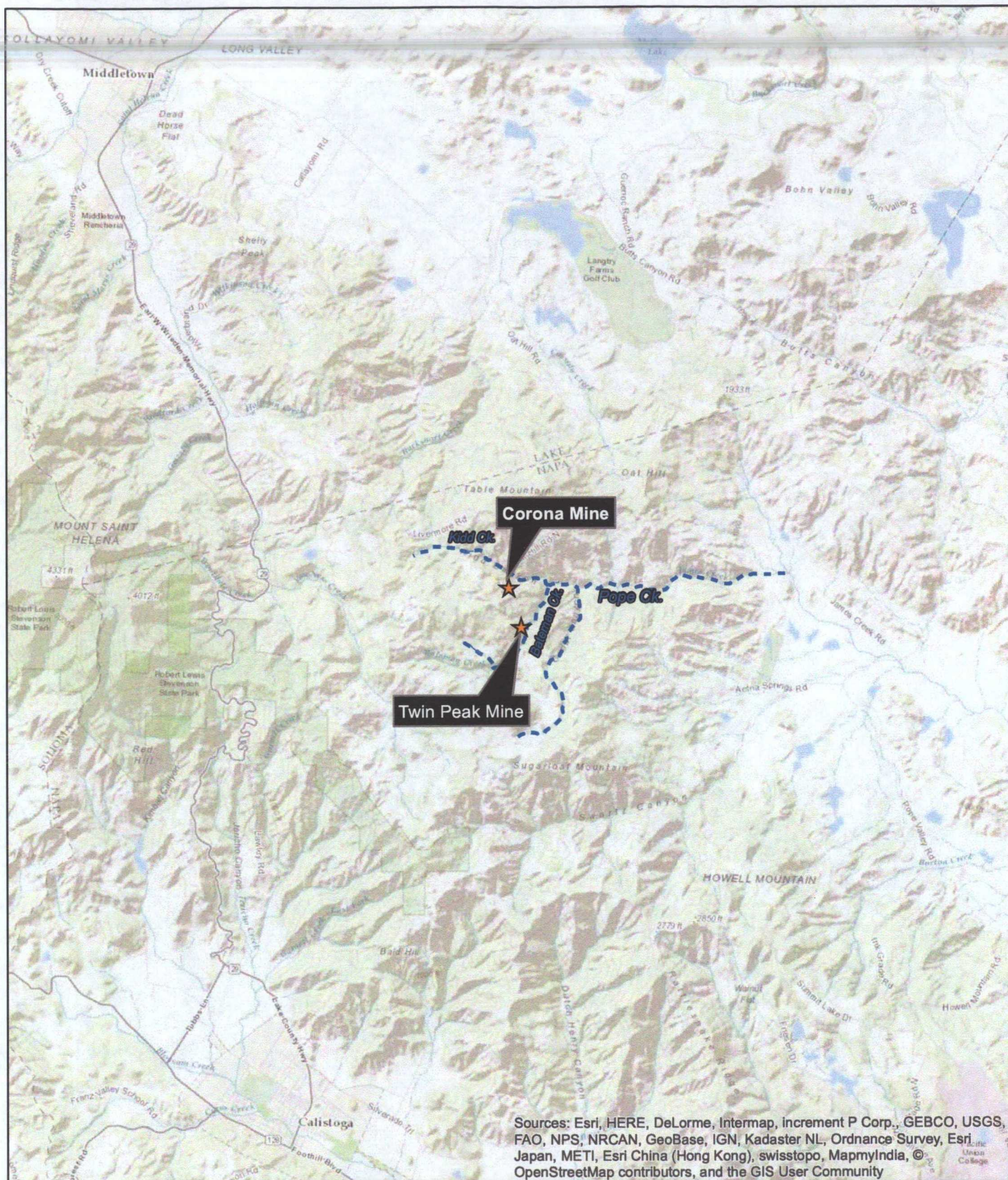
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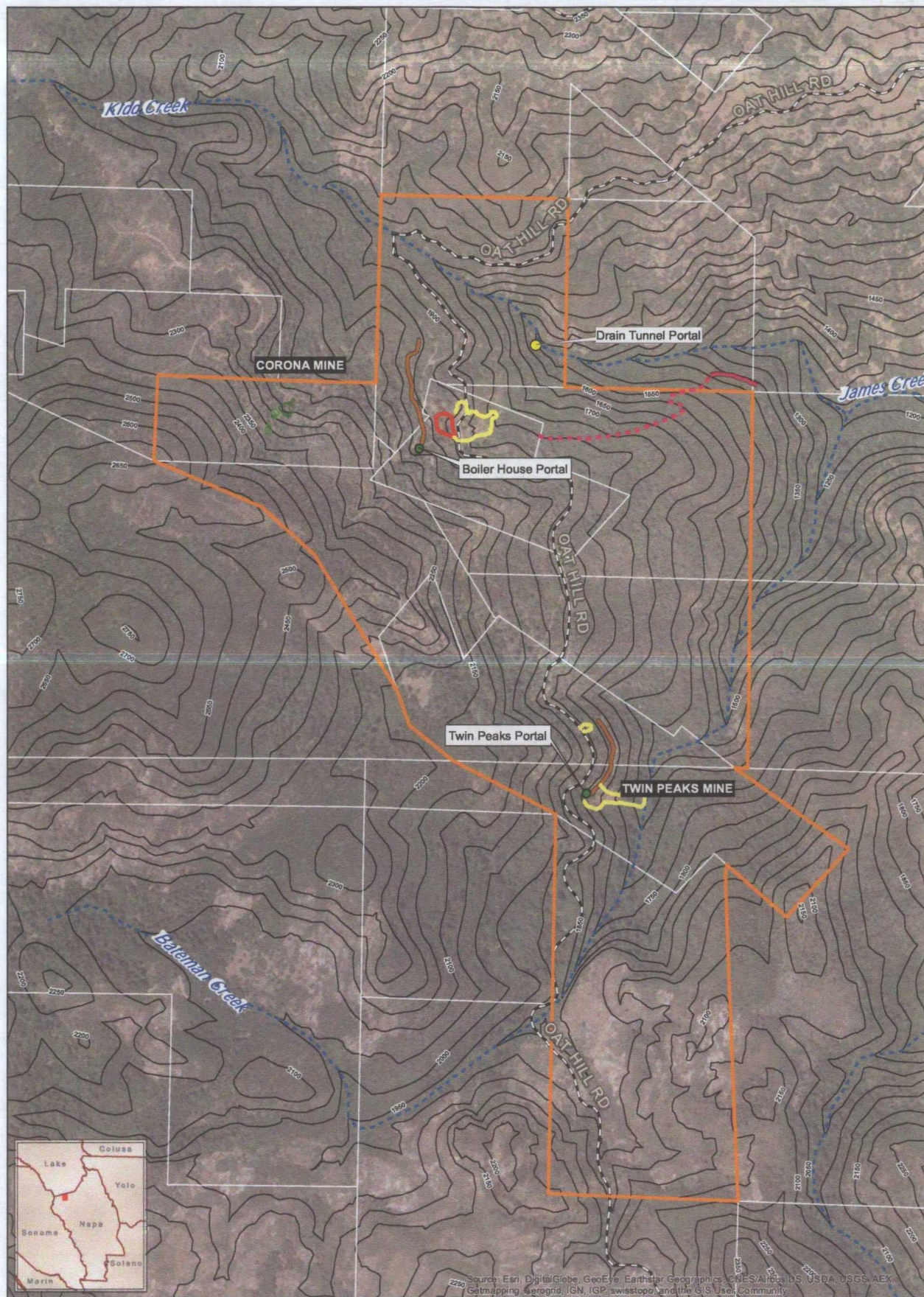
Jeffrey H. Wood, Acting Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice

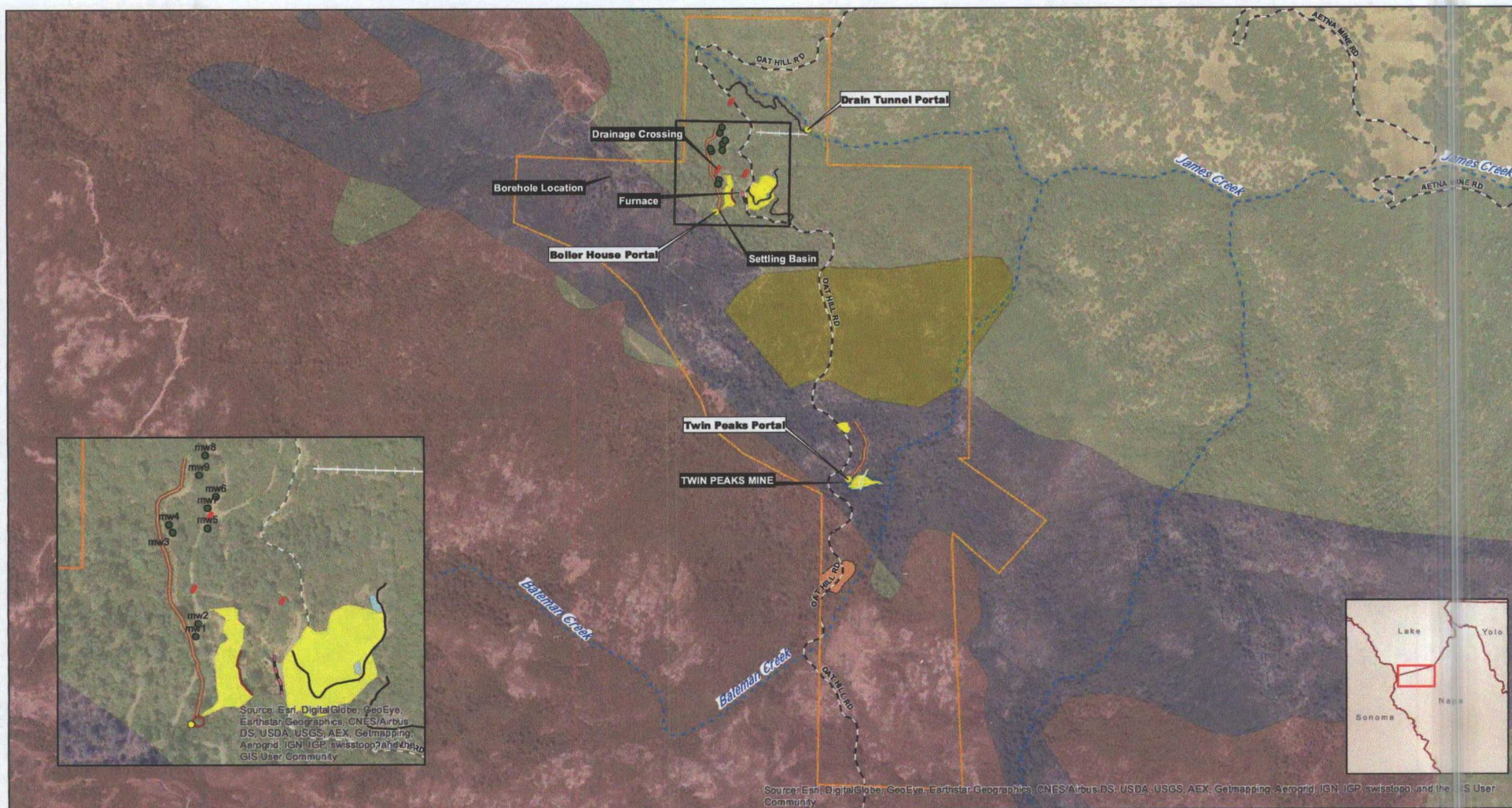
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APPENDIX 1

1-







Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- | | | | |
|-------------------------|---------------|--------------------------|------------------------------|
| John Livermore Property | Bench | Existing Path | Existing Infiltration Trench |
| Roads | Existing Path | Existing Rail Track Line | Settling Basin |
| Creeks | Timber Wall | Future Fence | |
| Portal | Drainage | | |
| Future Gate | | | |
| Monitoring Wells | | | |

- | |
|----------------|
| Settling Basin |
| Hunters Camp |
| Mine Waste |

Geologic Types

- | |
|---------------------------------------------|
| Jsp - Great Valley Complex serpentinite |
| KJfs - Franciscan Complex sedimentary rocks |
| Qsl - Hillslope Deposits |
| Tpmv - Sonoma Volcanic rocks |



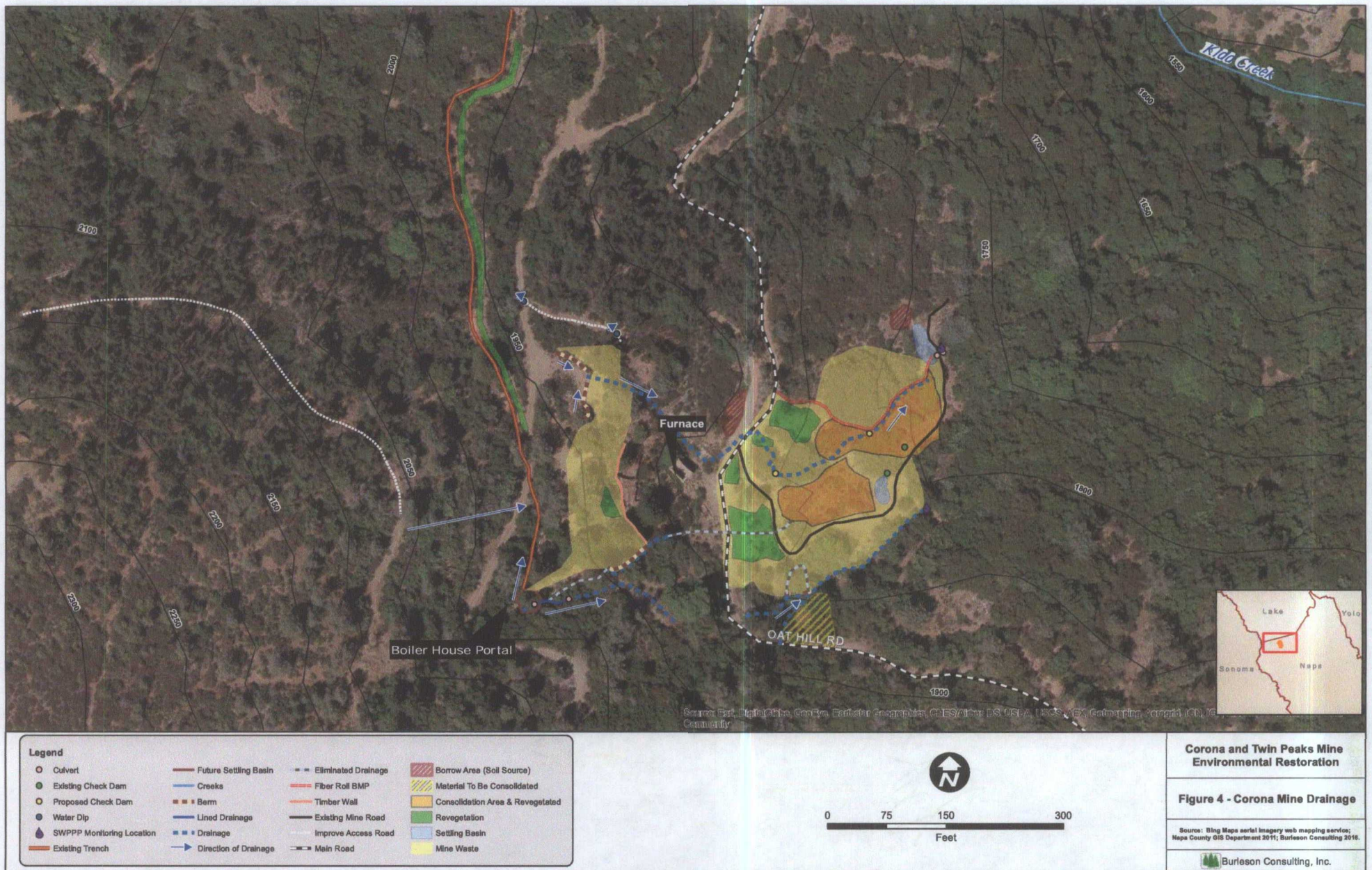
0 500 1,000 2,000
Feet

Corona & Twin Peaks Mine

Figure 3- Site Features

Source: Bing Maps aerial imagery
web mapping service; USGS 3012;
Napa County GIS Department; 2011;
Burleson Consulting 2013.

Burleson Consulting, Inc.





Corona and Twin Peaks Mine Environmental Restoration

Figure 5 - Twin Peaks Mine Drainage

Source: Bing Maps aerial imagery web mapping service;
Napa County GIS Department 2011; Burleson Consulting 2018.

Burleson Consulting, Inc.

APPENDIX 2

CORONA AND TWIN PEAKS MINE DRAINAGE TREATMENT PROJECT

**DEPARTMENT OF FISH AND WILDLIFE
ECOSYSTEM RESTORATION PROGRAM GRANT**

ERP Grant #: E1183005

**California Water Code, Chapter 5.7
Remediation Work Plan**

Prepared For:
Tuleyome, Inc.
607 North Street
Woodland, California 95695

Prepared By:
Burleson Consulting, Inc.
950 Glenn Drive, Suite 245
Folsom, California 95630

Remediation Work Plan

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Attachment IV	Access Agreement

1.0 Identification of the Remediating Agency

Division 7, Chapter 5.7 of the California Water Code was enacted by the California legislature to protect the public and waterways of the state from discharges at abandoned mine sites. The Legislature found that thousands of abandoned mines in California may contain waste including acid rock drainage that has a devastating effect on aquatic life and has degraded some major California water bodies, §13397(a)(1); complete elimination of acid rock drainage is not currently possible because acid rock drainage production can continue for centuries after mine abandonment and is difficult to control, §13397(a)(2); Cleanup of this waste for protection of the public and waterways of the state should be facilitated by limiting the financial responsibility for that cleanup, §13397(a)(3); and public agencies or private parties who are not otherwise legally responsible for the abandoned mined lands are reluctant to remediate abandoned mined lands without assurance that they will be responsible only for completion of the remedial work they undertake, §13397(a)(4).

Chapter 5.7 includes in the definition of a remediating agency at §13397.5(f) *"... any public agency, or private individual or entity acting under a cooperative agreement with a public agency, that prepares and submits a remediation plan in accordance with this section..."* Tuleyome is a non-profit volunteer organization focused on protecting the wild and agricultural heritage of the Inner Coastal Range and Western Sacramento Valley for current and future generations. Tuleyome is interested in addressing wastes at the Corona and Twin Peaks mines sufficiently to allow safe public access so that a regional trail system can be completed through the area. Tuleyome recognizes the need to address acid rock drainage at abandoned mined lands in general, and has determined that there may be a way to identify a long-term solution to acid rock drainage at the Corona Mine and thereby contribute to protection of water quality in an impaired waterway (James Creek).

Tuleyome is neither an owner nor an operator and does not have control over the Corona or Twin Peaks mine sites or any of the adits or tunnels. Tuleyome is not legally responsible for, has no financial interest in, nor has participated in any mining (including exploration) associated with the Corona or Twin Peaks mine sites. Tuleyome has prepared this remediation plan in accordance with Chapter 5.7 §13398.3 and seeks to become a remediating agency at the Corona and Twin Peaks mines to facilitate implementation of this remediation plan without incurring additional responsibility. Tuleyome maintains offices at 607 North Street, Woodland, California 95695. Bob Schneider is a Senior Policy Director at Tuleyome, and is the Project Lead, (530) 350-2599, bschneider@tuleyome.org. Sarah Husby-Good is the Executive Director of Tuleyome.

2.0 Identification of Abandoned Mined Lands that are the Subject of the Remediation Work Plan

Figure 1 shows the project location, and Figure 2 shows the mine locations.

The Corona and Twin Peaks Mines are inactive mercury mines within the East Mayacmas Mercury District (Yates and Hilpert, 1946). The project is located on lands owned by the Corona and Twin Peaks

Historical Association, LLC. The project area comprises 32 acres of mining disturbed lands within a larger 8-parcel holding of 328.8 acres in northern Napa County. The property is located along Oat Hill Mine Road and includes Napa County Assessor's Parcel Numbers (APNs) 016-020-035, 016-020-026, 016-020-020, 016-020-027, 016-020-023, 018-010-006, 018-010-007, and 018-010-009. Corona Mine is in the northern portion of the project area and project features are predominantly located on parcels with APNs 016-020-035 and 016-020-020, and 016-020-026. Twin Peaks Mine is located in the southern portion of John Livermore's holdings and project features are predominantly located on parcels with APNs 018-010-006 and 018-010-007. Figure 3 shows the mines and parcel boundaries.

The sites are at an elevation of about 1,900 feet and the topography is relatively steep and forested. The mines are located about 0.75 miles apart along the Oat Hill Road. The sites are on contiguous parcels consisting of about 32 acres.

The Corona and Twin Peaks mercury mines are located in the East Mayacmas Mercury Mining District. Mining began at the Corona Mine in 1895 and continued through 1906. The Corona Mine was intermittently worked during 1941 to 1943, and was explored further in 1956 (US Bureau of Mines 1965). About 5,000 flasks of mercury were reportedly produced from the Corona Mine. About 2 miles of underground mine workings were reportedly developed at the Corona Mine.

The Twin Peaks Mine was operated from 1902 to 1907, 1915 to 1918, and 1941 to 1943 with a production of 200 flasks of mercury (US Bureau of Mines 1965). About 4,200 feet of underground mine workings were reportedly developed at the Twin Peaks Mine.

Waste rock and tailings piles are present at the Corona and Twin Peaks mines (Figure 4). The property owner has implemented best management practices including revegetation and diversion of runoff away from these mine wastes to reduce erosion and drainage formation. However, improvements to the vegetative cover and runoff controls are necessary at both sites to further reduce erosion and drainage.

The Boiler House Adit, and the Corona Drain Tunnel at the Corona Mine, and the Twin Peaks Adit at the Twin Peaks Mine are each point sources for mine drainage. The property owner previously constructed infiltration trenches that collect drainage from the Boiler House Adit, and Twin Peaks Adit. These infiltration trenches prevent contact of the mine drainage with mine wastes and prevent discharge of mine drainage to surface waters. The drainage infiltrates into the soil and bedrock at each site. Drainage from the Corona Drain Tunnel discharges directly to Kidd Creek.

The features to be addressed by Tuleyome include installing a pilot scale system to reduce the metal loading from the Corona Drain Tunnel, consolidation of mine waste, improvements to runoff controls, enhancing revegetation of waste rock and tailings at the Boiler House Adit and Twin Peaks Adit, and improvements to the existing infiltration trenches at the Boiler House Adit and Twin Peaks Adit.

3.0 Identification of the Waters of the State Affected by the Abandoned Mined Lands

Kidd Creek traverses the northern portion of the property and Bateman Creek traverses the southern portion of the property. Both creeks meet at a confluence to the east of the property forming James Creek. Kidd Creek drains the Corona Mine area, and Bateman Creek drains the Twin Peaks Mine area. James Creek originates at the confluence of Bateman and Kidd Creeks located about 0.25 miles downstream from the Corona Mine, and about 0.35 miles downstream from the Twin Peaks Mine.

James Creek is a tributary to Pope Creek that enters Lake Berryessa, a sport fishery and source of drinking water about 13 miles downstream from the Sites. The affected surface waters are Kidd Creek, Bateman Creek, James Creek, and Pope Creek. James Creek is included on California's 303(d) list as impaired for mercury and nickel.

4.0 Description of the Physical Conditions at the Abandoned Mined Lands That are Causing Adverse Water Quality Impacts

Sampling of drainage at the Corona Drain Tunnel by Regional Board staff in 1997 identified iron and nickel in the drainage and Kidd Creek downstream from the tunnel that were elevated above water quality criteria. A 2002 technical report concluded that nickel concentrations downstream from Twin Peaks Mine periodically exceeded the chronic aquatic life water quality criterion (MFG 2002). Results from field investigations completed during 2003 and 2004 by the US Geological Survey, and EnviroGeo during 2007 documented that the Corona and Twin Peaks mines release iron, sulfate, nickel, and mercury to the James Creek watershed (USGS 2007, EnviroGeo 2007).

Mine wastes that include waste rock and calcined tailings at both of the mine sites are present on steep slopes adjacent to seasonal drainages (surface water runoff occurs only during and immediately after rain events). Metals and salts present in the mine wastes could be mobilized to surface water through erosion and transport downhill, and/or through dissolution of soluble materials and transport in runoff to surface water. Existing systems to control potential transport of contaminants from mine wastes to surface water at the sites are described below.

The Boiler House Adit discharges mine drainage at about 5 to 50 gpm. Drainage flow varies seasonally with rainfall and the observed peak flow was 80 gpm based on observations since 2003. Boiler House Adit drainage pH varies from about 4.8 standard units (SU) to 6.8 SU and contains iron (4.7 mg/L to 14 mg/L) and nickel (3.2 mg/L to 3.5 mg/L) above water quality criteria. Boiler House Adit drainage has been effectively controlled by diversion to an infiltration trench since 1998 (see below). Existing systems to control Boiler House Adit drainage are described below.

The Twin Peaks Adit discharges mine drainage at about 2 to 35 gpm. Drainage flow varies seasonally with rainfall and the observed peak flow was 60 gpm based on observations since 2003. Twin Peaks Adit drainage pH varies from about 4 SU to 7 SU and contains iron (0.4 mg/L to 9 mg/L) and nickel (1.2 mg/L to 1.5 mg/L) above water quality criteria. Existing systems to control Twin Peaks Adit drainage are described below.

Corona Drain Tunnel discharges about 25 gpm to 60 gpm seasonally with 100 gpm peaks during extreme rain years based on observations since 2003. Corona Drain Tunnel pH varies from about 3 SU to 6 SU and contains iron (62 mg/L to 130 mg/L) and nickel (4.0 mg/L to 5.4 mg/L) above water quality criteria. Proposed systems to reduce metal loading from the Corona Drain Tunnel drainage are described below.

5.0 Description of the Practices Proposed to Reduce, Control, Mitigate, or Eliminate the Adverse Water Quality Impacts

Practices to reduce, control, mitigate or eliminate the adverse water quality impacts at Corona and Twin Peaks mine sites are described for existing and proposed systems. The property owner has implemented existing systems to reduce and eliminate adverse water quality impacts resulting from discharge of drainage from the Boiler House and Twin Peaks adits, and resulting from interaction of mine drainage with mine waste at the sites. Tuleyome is proposing to enhance these existing systems and to complete a pilot scale subsurface chemical amendment system to reduce metal loading from the Corona Drain Tunnel.

5.1 Existing Systems

Existing systems are the best management practices (BMP) used to reduce potential impacts from mine waste piles at the Twin Peaks and Corona mines, and the infiltration trenches used to control mine drainage at the Twin Peaks and Boiler House adits. These existing systems are present at the sites and are not managed or controlled by Tuleyome.

5.1.1 Best Management Practices

BMPs implemented at the Corona mine include diversion of seasonal surface water flows away from mine waste, use of swales and check dams to slow runoff velocity and minimize sediment transport, grading to control the flow of water and minimize erosion, and establishing native plant cover on exposed surfaces. The best management practices are consistent with provisions of Title 27, Chapter 7, Subchapter 1. Mining Waste Management describing precipitation and drainage controls (§22490(h)).

Run-on Diversion. Figure 5 shows the Corona Mine including locations of pre-diversion drainage flow and the current run-on diversion system and the Corona Drain Tunnel. Prior to diversion of run-on, seasonal flow originating uphill from the Boiler House Adit flowed across waste rock and tailings, contributing to erosion and off-site transport of mine waste, and creation of mine drainage. The existing diversion system consists of an unlined channel that directs surface water through a 'trash rack' and into a culvert which prevents contact of the water with the waste rock. The culvert discharges to the original drainage course located south of the tailings pile.

Figure 6 shows the Twin Peaks mine including the locations of pre-diversion drainage flow and the current run-on diversion system. Before diversion, runoff from the slopes above the site flowed across the calcine tailings contributing to erosion and off-site transport and creation of mine drainage. The existing diversion system consists of a subsurface pipe that separates runoff from the mine waste and conducts it to the north edge of the tailings where the water flows into a natural drainage to Bateman Creek, minimizing contact with the tailings.

The existing run-on diversion systems prevent contact of run-on with waste rock and tailings. This has minimized the amount of mine drainage created at the sites and reduced the erosion and transport of waste rock and tailings from the site.

Erosion Controls. Erosion controls at the Corona Mine consist of berms at the top of the waste rock and grading of the road through the tailings pile (Figure 5). Berms at the top of the waste rock interrupt sheet flow and direct the water away from the waste rock and onto nearby forested slopes. Prior to creation of the berms, this water flowed onto the waste rock contributing to erosion and creation of drainage. The road through the tailings was regraded to direct water away from the seasonal drainage south of the tailings and into the rock lined swale. Prior to regrading, runoff from the road entered the seasonal drainage. The berms help to control erosion by directing water away from the waste rock. The regraded road surface protects underlying tailings from erosion and directs runoff to the rock lined swale.

Erosion controls at the Twin Peaks mine consist of benches on the mine waste, and berms and water bars (Figure 6). The benches slow the velocity of sheet flow and disperse the flow resulting in settling of sediment on the benches, and reduction of erosion and transport. The berms are located at the down slope edge of the bench and direct sheet flow away from the loose slope on tailings. The water bar directs runoff from an old haul road away from the tailings.

Run-off Controls. Run-off controls consist of a rock lined swale and check dams installed within the tailings pile at the Corona Mine. The swale collects run-off from the tailings and the check dams slow the runoff to allow settling of suspended particles. Prior to construction of the swale, runoff from the tailings flowed overland to adjacent drainages and down slope. This overland flow allowed erosion and transport of tailings to Kidd Creek. The swale extends along the middle of the tailings pile and conducts runoff to a settling basin at the toe of the tailings pile (Figure 5). The swale and check dams reduce erosion and transport of tailings by intercepting the overland flow and providing for settling of suspended particles at the check dams.

Revegetation. Revegetation at the Corona and Twin Peaks mines consists of plantings of locally collected seeds from native grasses, forbs, shrubs, and trees that grow on the mine waste and along the infiltration trenches. Some surfaces on waste rock and tailings (other than roads), and some slopes are revegetated with native shrubs, grasses, and trees. Revegetation stabilizes the soil helping to prevent erosion and off-site transport of mine waste. The plants also transpire water reducing the quantity of drainage that is generated. Plants were initially irrigated using an irrigation system. This irrigation system remains in place and can support additional revegetation efforts if necessary.

Plants established along infiltration trenches help to stabilize soils used to make the trench, and transpire water.

5.1.2 Infiltration Trenches

Infiltration trenches are used to prevent overland flow of mine drainage at the Boiler House Adit, and Twin Peaks Adit (Figure 5 and 6). Prior to trench construction, drainage from each of the adits flowed across and through mine waste. The trenches receive all of the drainage at each of the sites and prevent

contact of the mine drainage with waste rock or tailings. Infiltration of the drainage through native soil and rock also prevents overland flow of the mine drainage to surface water. Drainage is intercepted at the mouth of each adit and routed through a pipeline into the trench at each site. Multiple valves and check dams within each trench are used to direct drainage into specific trench segments to allow maintenance, if necessary, while continuing to control the drainage. The infiltration trenches comprise Group B mine waste management units in accordance with Title 27, Chapter 7, Subchapter 1. Mining Waste Management (§22480).

Trench characteristics are summarized in the table below.

Location	Length (feet)	Depth (feet)	Bedrock	Drainage Flow (gallons per minute)
Boiler House Adit	435	3 to 4	Sandstone	5 to 50
Twin Peaks Adit	600	2 to 3	Serpentinite	2 to 35

Monitoring wells are present adjacent to the Corona infiltration trench (Figure 4 inset). The wells were constructed by drilling to the depth of refusal (7.5 to 15 feet below ground surface), installing a perforated polyvinylchloride well screen at the lower 5 feet threaded to a blank casing, and backfilling the borehole to the surface. Groundwater is measured within only three of the wells (MW-3, MW-5, and MW-7) during the winter months despite their close proximity to the infiltration trench. In addition to monitoring wells, the slopes below the infiltration trench are periodically inspected for signs of seepage (aquatic vegetation, vigorous vegetation during the dry season, and wet or moist soil). One seasonal seep has been observed downhill from the Corona infiltration trench. This seep dries up during the annual summer drought. Lack of groundwater in the monitoring wells, and lack of persistent moisture on the slopes below the infiltration trench is herein interpreted as evidence that the acid rock drainage infiltrates to bedrock beneath the infiltration trench. Infiltrating water from the Corona trench is expected to ultimately migrate to the Corona Drain Tunnel (the drain tunnel crosses under the Corona trench about 430 feet beneath the trench bottom) along foliation and fractures of the intervening rock. Thus, any impacts of the infiltrating water are detectable in the drain tunnel drainage.

Monitoring wells are not present at the Twin Peaks infiltration trench. However, the slopes below the infiltration trench are periodically inspected for signs of seepage (aquatic vegetation, vigorous vegetation during the dry season, and wet or moist soil). No evidence for seepage from the Twin Peaks infiltration trench has been observed and the acid rock drainage is considered to infiltrate to bedrock beneath the infiltration trench. Infiltrating water beneath the Twin Peaks infiltration trench is expected to ultimately seep to Bateman Creek down slope from the infiltration trench via foliation and fractures in the intervening rock. Thus, monitoring of water quality in Bateman Creek up and downstream from the Twin Peaks Mine would detect any impacts of the infiltrating water.

5.2 Proposed Systems

Proposed systems are installation of a pilot system to implement subsurface chemical amendment with the goal of reducing the metal load from Corona Drain Tunnel drainage; consolidation of mine waste, revegetation of remaining bare slopes within the calcine tailings piles at Corona and Twin Peaks Mines,

and replumbing of the infiltration trenches at the Boiler House and Twin Peaks adits to provide for more effective and efficient management of variable flows over time, and for management of iron-rich precipitates if necessary.

5.2.1 Mine Waste Consolidation and Stabilization

Consolidation of mine waste will involve moving about 200 cubic yards of mine waste at the Corona calcine pile from its current location to an area within the main pile (Figure 5). This action will reduce the area of mine waste at the site, directly reducing the area of the material available to generate drainage by about 3,000 square feet. Stabilization will include grading up to 100 cubic yards of mine waste at the Twin Peaks mine to reduce the surface area, minimize traffic related disturbances of the mine waste, and stabilize the slope (Figure 6). The areas disturbed by consolidation and stabilization will be then be revegetated as part of the project.

5.2.2 Revegetation

Revegetation will include soil amendment and planting native grasses, shrubs, and forbs propagated from locally collected seed. Revegetation is expected to reduce the amount of erosion from the waste rock and calcined tailings piles, and decrease the amount of infiltration thereby reducing the production of drainage from the mine waste. Minimizing erosion and the amount of the drainage will improve water quality in Kidd and James creeks by preventing the associated sediment and metals (including nickel and mercury) from entering the surface water.

Revegetation efforts will include evaluating soil conditions that limit plant growth. Such conditions present at the sites include excess acidity, compaction, excess drainage and seasonal dryness, and miscellaneous nutrient imbalances. Potential treatments to address these conditions will include neutralization of acidity, mechanical de-compaction using either hand held power tools or heavy equipment as appropriate for the site, introduction of finer soil materials or deep rooting conduits for dry areas, and low rates of nutrient amendment appropriate for supporting native plants and limiting weed growth. Treatments will be applied on an as-needed basis recognizing the natural, modest fertility character of the site in general. Plants that actively transpire larger amounts of soil moisture will be a priority for establishment. On steeper slopes at or near the angle of repose, special care will be taken to deeply inject soil amendments with minimal surface disturbance, typically not much more than a foot path for access. Deep placement of amendments (as needed) helps establish woody shrubs that increase the structural stability of the site and cover a larger area of the bare surface as their canopy matures. Appropriate treatments are generated based on ambient acidity, moisture retention and nutrient conditions.

5.2.3 Improvements to Existing Infiltration Trenches

Improvements to the existing infiltration trenches at the Boiler House and Twin Peaks portals will consist of installing settling basins to facilitate effective solids management, re-plumbing the distribution systems at each site, and improving vegetation at each trench. Re-plumbing will allow more effective operations under seasonal changes in flow, improved level controls between trench reaches, and facilitate isolating separate reaches of each trench for maintenance such as widening and sloping trench bottoms. Improved vegetation along the infiltration trenches will increase stability of slopes below the

trenches, and increase the amount of water that is transpired. In addition, access to the trenches will be improved to increase worker safety. Diversion of runoff from slopes above the trenches would also be completed at locations where concentrated flow enters the trenches.

5.2.4 Subsurface Chemical Amendment

Subsurface chemical amendment, if determined to be effective at the Corona Mine, would identify a method to substantially reduce the metal loading from the Corona Drain Tunnel through introduction of chemicals to change the chemical environment and prevent mobilization of metals at the source.

Effectiveness of this technique at Corona Mine would be determined through performance of a tracer study and subsequent pilot scale operations. The tracer study would use the travel time and concentration of a non-toxic tracer released at the source area and detected in Corona Drain Tunnel drainage to evaluate chemical dosing rates for subsurface chemical amendment. This pilot study would be performed in the subsurface at the site (in-situ).

The tracer study would be performed by first advancing bore-holes to the vicinity of underground mine workings at the level of the Boiler House Adit, and a stope (mine void) located beneath Tunnel No. 1. The Boiler House Adit level is referred to as the '1,853' level on site mine maps based on the elevation of the tunnel. A significant ore body and stope (void created during mining) associated with the 1,853 level are shown on mine maps and cross sections (Figure 7). The bore hole would be advanced at an angle from the ground surface using a drilling technique that will allow identification of the geologic materials encountered during drilling. The location of the drill bit would be monitored during drilling, and the borehole length will be compared to projected distances from the surface location to the ore body and stopes. The goal of advancing the borehole would be to encounter saturated mineralized rock, complete the borehole to allow application of tracers, and later application of sodium hydroxide and ethanol to amend subsurface chemical conditions. At least two boreholes are currently envisioned advancing 250 feet and 400 feet to two different targets in the subsurface.

The boreholes would be converted into cased remediation wells for use in applying subsurface chemical amendments during pilot scale and future full scale operations. Pilot scale operations would allow evaluation of the chemical dosing rates, design, and operation of the full scale chemical delivery system. While short term (about 60 to 90 days), pilot scale operations (if successful) are expected to provide longer term improvement in water quality by initially precipitating metals, and then impeding oxidation of the sulfide minerals beyond the duration of the pilot operations. Metal bearing precipitates are anticipated to remain within the fractures and foliation through which groundwater currently migrates. The goal of the pilot study is not so much to precipitate metals, but instead to prevent metal mobilization via amending the subsurface chemical environment. Substantial intermediate improvement of water quality could be attained through the pilot activities via armoring of some reactive sites within the source area for the drainage. Substantial long term improvement of water quality could be then attained via longer term implementation of the technique. The duration of water quality improvements expected from the subsurface chemical pilot scale dosing is uncertain without the quantitative results from the tracer study.

The chemical used for the initial tracer study will be detergent that contains a brightener chemical, disodium diaminostilbene disulfonate, which will be released into the borehole and measured in the outfall at the Corona Mine Drain Tunnel Portal. This chemical is reported to be stable under acidic conditions, and is detectable using the analytical technique fluorescence spectroscopy (fluorometry). If the tracer chemical is detected in the outfall discharge at the Corona Drain Tunnel Portal within a residence time of about one day, then the addition of an organic lipid, such as ethanol, will be used to stimulate the growth of sulfate-reducing bacteria within the mine. Ideally, if the reducing conditions can be established within the mine, the metals will be removed by the sulfate reduction and sulfide precipitation. This would be the preferred method to precipitate metals because metal sulfides have a low solubility at near-neutral pH. However, if the tracer test indicates a longer residence time before the tracer chemical is detected in the Corona Drain Tunnel Portal discharge, then this condition would not be considered adequate for sulfate-reducing bacteria and the pH will be reduced using sodium hydroxide. This would then increase the availability of sulfide for precipitation. Even if sulfate-reducing conditions using ethanol cannot be established, the majority of metals (95% plus) would still be precipitated by hydroxide precipitation with the addition of sodium hydroxide. Therefore, the following parameters will be measured in the discharge at the Corona Drain Tunnel Portal: tracer chemical in detergent solution, metals, pH, sulfate, alkalinity, oxidation-reduction potential, and organics (organic lipids or ethanol).

Jar tests in which sodium hydroxide was used to neutralize drain tunnel drainage were performed and identified that metals were precipitated and the pH raised to circum-neutral (TKT 2013). The application rate for any chemicals used to amend subsurface chemical conditions will be carefully estimated based on the results of the tracer study, and site water chemistry. This will be done to minimize the likelihood for mobilizing metals such as manganese that may be present naturally within the subsurface or creating extreme chemical conditions such as elevated pH. Monitoring of drain tunnel discharge during and after the pilot test would also provide for direct measurement of any metals mobilized by the pilot test or presence of extreme chemical conditions.

5.2.5 Implementation Plan

Construction will occur in phases including mobilization, site preparation, mine waste, consolidation at the Corona Mine, expanding the revegetated area at each site, re-plumbing of infiltration trenches, site restoration, and demobilization. Construction will occur in accordance with a site management plan and site safety plan that are provided as components of the implementation plan outlined in Attachment I. The implementation plan will also identify mitigation measures necessary to avoid significant impacts to the environment. Construction equipment will include, but not be limited to, a bulldozer, backhoe, dump truck, loader, all-terrain vehicle, drill rig, and standard pickup truck. Other equipment will include a compact concrete mixer, hydro-mulcher, and welder.

5.2.6 Operation and Maintenance Plan

Operations will consist of commissioning, shake down operations, and routine operations and maintenance. Operations will begin as construction ends with infiltration system commissioning.

Commissioning activities will consist of leak testing the new plumbing at each infiltration trench, confirming that valves and control structures along the trenches are functioning as intended, and verifying that water is infiltrating to the subsurface beneath the trenches.

Shake down operations will consist of a three week period during which daily observations of the pipeline, and infiltration trenches will be made to confirm system operations.

Routine operations will consist of those periodic activities necessary to ensure that the infiltration systems operate as intended. Routine operation and maintenance activities are anticipated to commence about one month after construction is complete. The Operation and Maintenance (OMM) Plan will be prepared after shake down operations are completed. Routine operations are anticipated to consist of periodic visual inspections of the pipeline and trenches, and periodic flow adjustments at the valves along each trench in response to changing flow conditions. Maintenance activities are anticipated to consist of semi-annual pipeline clean out, quarterly inspection and debris clearing along the trenches, and monthly monitoring of slopes below the infiltration trenches.

5.3 Implementation Schedule

Project construction is planned to begin in Fall 2013 and requires about 9 months with completion expected by Summer 2014. The project will be completed in eight overlapping phases, estimated as follows: (1) minor grading of roads to ensure safe passage of vehicles and equipment (September 2013); (2) improving existing infiltration systems (September to August 2013); (3) consolidating mine waste and grading (September 2013); revegetation (March through October); (4) installing bat-friendly gates on portals and adits, and installing fences around upper Corona Mine ore processing area and furnace (June 2014); (5) completing surface drainage work to stabilize and divert water before the rainy season (September to November 2013, and 2014 as warranted); (6) Revegetation (September 2013 to June 2014); Completing and evaluating a tracer test, then designing and implementing an appropriate subsurface chemical amendment study at the Coronal Drain Tunnel (September 2013 to March 2014); (8) providing erosion control (September 2013 to June 2014).

6.0 Analysis Demonstrating That Implementation is Expected to Cause Substantial Improvement in Water Quality for the Identified Waters

The baseline condition for assessing substantial improvement in water quality for Kidd Creek and James Creek is the current condition. Current conditions are evaluated with respect to the features addressed by this remediation work plan: consolidation and revegetation of mine waste, control of drainage at the Coronal Drain Tunnel, and improvements to existing systems.

6.1 Mine Waste Consolidation and Stabilization

This project includes consolidation of mine waste at the waste rock and calcined tailings present at the Corona and Twin Peaks mines. The mine waste piles are considered to be existing mining units in accordance with Title 27, Chapter 7 §22470. Total and leachable metal concentrations available for mine waste at the Corona and Twin Peaks mines are summarized in Table 1. Total concentrations of

July 8, 2013

metals in waste rock and tailings at the Corona and Twin Peaks mines are below the total threshold limit concentration (TTLC) for all metals except mercury. Mercury is present above the 20 mg/kg TTLC in each of the four waste rock and tailings samples (250 mg/kg to 840 mg/kg total mercury). Soluble threshold limit concentration (STLC) criteria for waste classification are also compared with California waste extraction test (WET) extract analyses in Table 1. All WET metals results are reported below the STLC criteria for mine waste in extracts from Corona and Twin Peaks mine waste. Distilled water (DI) WET extract metal analyses are also summarized in Table 1 and compared with retardation factors estimated using site specific soil properties and the VZCOMML model. The quotient of the DI WET extract metal concentrations to the retardation factors for each metal is less than water quality criteria, thus, the mine wastes are not expected to yield leachate concentrations that would threaten groundwater quality (the mine wastes are not a designated waste).

Results of acid base accounting show that waste rock at the Corona Mine, and calcined tailing at the Twin Peaks Mine have a low potential to generate acidic leachate (Acid neutralization potential (ANP):Acid generation potential (AGP) > 1). The calcined tailings at the Corona Mine have a ANP:AGP of about 0.5 and could generate acid drainage.

Based on the mine waste characterization information presented above, the mine waste may be classified as Group B mine waste as defined in California Code of Regulations (CCR) Title 27, without taking any other factors into consideration. Per Section 22480(C) of CCR Title 27, which pertains to the management of mining waste, mine waste classification should also consider concentration of hazardous constituents, acid generating potential, and properties of the waste that make it readily containable by less stringent measures. While the mine wastes at the Corona and Twin Peaks mines contain total mercury above the TTLC, this mercury is relatively stable, does not contribute to leachate that exceeds hazardous waste criteria, and does not leach mercury or other constituents at concentrations that would threaten water quality under site conditions. Thus, so long as the mine wastes are protected from erosion and transport to surface waters, they would not pose a threat to water quality. Because the mercury and other constituents pose a low threat to water quality under site conditions, so long as erosion and transport of the material to surface water is prevented, they could be considered as Group C waste. Potential threats to water quality from mine wastes at the Corona and Twin Peaks mines are readily containable by measures that are less stringent than those required for Group B waste. Mine wastes at the Corona and Twin Peaks mines should continue to be managed as Group C waste in mine waste units under Title 27.

Consolidation of mine waste will involve moving about 200 cubic yards of mine waste at the Corona calcine pile (Figure 3) from its current location to an area within the main pile. This action will reduce the area of mine waste at the site, directly reducing the area of the material available to generate drainage by about 3,000 square feet. Stabilization will include grading up to 100 cubic yards of mine waste at the Twin Peaks mine to reduce the surface area, minimize traffic related disturbances of the mine waste, and stabilize the slope. The areas disturbed by consolidation and stabilization will then be revegetated as part of the project.

6.2 Revegetation

Current conditions of the waste rock and tailings piles at each site include areas that are devoid of vegetation. Such bare areas are subject to erosion that can lead to off-site migration of metal laden particulates in air and water, and high rates of infiltration that can lead to creation of metal laden drainage. Existing data collected by USGS (2007) and EnviroGeo (2007) show that metal laden particulates are present in sediment downstream from the Corona and Twin Peaks mines. Data collected by USGS (2007) and EnviroGeo (2007) also showed that drainage from the calcined tailings was capable of transporting metals including mercury and nickel off site.

Minimizing erosion and the amount of the drainage will improve water quality in Kidd and James creeks by preventing the associated sediment and metals (including nickel and mercury) from entering the surface water. Increasing the amount of vegetative cover will also minimize the creation of airborne dust from the mine waste piles.

6.3 Improvements to Existing Infiltration Trenches

Improvements to the existing infiltration trenches at the Boiler House and Twin Peaks portals will consist of re-plumbing the distribution systems at each site, and improving vegetation at each trench. Re-plumbing will allow more effective operations under seasonal changes in flow, and facilitate isolating separate reaches of each trench for maintenance. Improved vegetation along the infiltration trenches will increase stability of slopes below the trenches, and increase the amount of water that is transpired.

6.4 Subsurface Chemical Amendment

Subsurface chemical amendment, if determined to be effective at the Corona Mine, would identify a method to reduce the metal loading from the Corona Drain Tunnel through introduction of chemicals (sodium hydroxide, ethanol, inoculum containing sulfide reducing bacteria) to prevent mobilization of acid and metals at the source. Effectiveness of this technique at Corona Mine would be determined through performance of a tracer study and subsequent pilot scale operations. The tracer study would be performed after drilling and constructing cased remediation wells. The remediation wells would be advanced to allow application of chemical amendments directly to the acid and metal sources (ore bodies and stopes) as shown on existing mine maps. The tracer study would use the travel time and concentration of a non-toxic tracer released at the source area and detected in Corona Drain Tunnel drainage to evaluate chemical dosing rates for subsurface chemical amendment.

The pilot scale operations would allow evaluation of the chemical dosing rates, design, and operation of the full scale chemical delivery system. While short term (about 60 to 90 days) the pilot operations (if successful) are expected to provide longer term improvement in water quality by precipitation of metals, and reducing oxidation of the sulfide minerals during the study. Substantial intermediate improvement of water quality could be attained through pilot operations via potential armoring of some reactive sites within the source area for the drainage. Substantial long term improvement of water quality could be then attained via longer term implementation of the technique. The duration of water quality improvements expected from pilot scale subsurface chemical amendment is uncertain without the quantitative results from the tracer study.

7.0 Description of Monitoring or Other Assessment Activities to be Undertaken to Evaluate the Success of the Proposed Practices

Monitoring and assessment activities include ongoing baseline monitoring, maintenance activities necessary to sustain the proposed practices, and assessment to evaluate project success. These project components are described below. Activities to evaluate project success consist of surface water and biota monitoring, system maintenance, and assessment of monitoring results. Baseline conditions are being evaluated through pre-construction sampling along Kidd and Bateman Creeks, and of mine drainage at the Boiler House and Twin Peaks Adits.

Monitoring activities will include continued collection and analysis of samples along Kidd and Bateman Creeks and from the adits, as well as monitoring necessary to ensure the function of the project components as described in the OMM plan. Monitoring is intended to comply with Title 27 requirements, and is anticipated to include analysis of for total metals, water quality parameters (pH, specific conductance, oxidation reduction potential, temperature), major ions, and chemicals introduced to the subsurface (sodium hydroxide and ethanol).

7.1 Baseline Conditions

Baseline conditions for the project are based on mapping and photos of mine wastes and associated best management practices, results of monthly surface water sampling and laboratory analysis at Corona and Twin Peaks during 2012-2013, and biosentinel monitoring completed during 2012. Baseline conditions include bare slopes on mine waste (Attachment III), sparse vegetation along the infiltration trenches, and measureable increase in metal concentrations in Kidd Creek downstream from the Corona Drain Tunnel, and increase in metal concentrations in Bateman Creek downstream from the Twin Peaks tailings. Baseline surface water monitoring results collected through monthly sampling and analysis of surface water at the site will be graphically and quantitatively compared with post implementation monitoring results to assess improvements. Attachment III contains photographs of the bare slopes on calcines at Twin Peaks, and sparsely vegetated areas on Calcines at Corona. Periodic (seasonal) photos will be taken from the same locations to provide for qualitative and quantitative comparisons of revegetation success. The ongoing revegetation efforts have provided significant information regarding plants and associated practices to support vegetation efforts and test plots are not anticipated to be necessary as part of this project.

7.2 Monitoring Activities

Monitoring activities will consist of periodic inspections of the sites, comparison of successive vegetation surveys as revegetation of mine wastes progresses, quarterly surface water sampling, and biosentinel monitoring at James Creek. Surface water monitoring would be performed in accordance with waste discharge requirements under Title 27.

Monitoring of subsurface chemical amendment will also include daily to weekly sampling for up to 3 months after injection to assess the benefits of subsurface chemical amendment. This monitoring is anticipated to include analysis of for total metals, water quality parameters (pH, specific conductance,

oxidation reduction potential, temperature), major ions, and chemicals introduced to the subsurface (sodium hydroxide and ethanol).

Monitoring will be performed in accordance with the OMM plan to be prepared after re-plumbing of the existing trenches is completed, and after operation of the pilot subsurface chemical amendment system.

7.3 Maintenance Activities

Maintenance activities will include inspection of the mining units and adjustments to other project systems in accordance with the OMM plan. Maintenance activities at the infiltration trenches are anticipated to include inspection and maintenance of erosion control best management practices, cleanout of pipes, valve adjustment, and solids management. Maintenance of the BMPs is anticipated to include inspections, sediment removal, and minor repairs. Maintenance of revegetation is anticipated to include limited watering (if necessary) during the first two years to support establishment of the plants.

7.4 Assessment Procedures

Assessment procedures will include quantitative comparisons of baseline and post project metal concentrations in water, associated load estimates, comparisons of baseline and post project biosentinal monitoring results, and qualitative comparisons of baseline and post project photographs to document revegetation progress.

8.0 Budget and Identified Funding to Pay for the Implementation Plan

In 2011, Tuleyome was awarded a three-year, \$1.5 million dollar grant by the California Department of Fish and Game's (now Fish and Wildlife) Ecosystem Restoration Program to address drainage waters from the Corona and Twin Peaks Mines in northwest Napa County.

9.0 Remediation Goals and Objectives

Remediation goals and objectives are to consolidate mine waste, revegetate mine waste piles, improve the operational flexibility of the infiltration trenches, and identify and design a method to substantially reduce metal loading from the Corona Drain Tunnel to Kidd Creek. These goals are described below.

9.1 Mine Waste Consolidation Units and Stabilization

Consolidation into existing mine waste units will result in reducing the area covered in mine waste, and in which mine drainage is generated. Stabilization reduces the likelihood for traffic related disturbance of the mine waste. Pre- and post- consolidation maps of mine waste will be compared to document the reduction in area covered by mine waste.

9.2 Revegetation of Mining Units

Current conditions include slopes devoid of vegetation at Twin Peaks, and slopes covered with sparse grasses at Corona and Twin Peaks. Increased vegetative cover will be documented through annual

surveys and comparison of photographs. The goal of revegetation is to establish plants on bare slopes, and increase coverage on sparsely vegetated areas.

Erosion of mine waste occurs along the north side of the Corona calcines under current conditions. Erosion would be reduced by implementing BMPs including emplacing straw wattles and erecting rock check dams to retain sediment on site. Efficacy of the BMPs will be assessed through inspection of the wattles and check dams for accumulated sediment. Photographs and maintenance logs detailing the removal and disposition of accumulated sediment will be used to document effectiveness. Sediment will be placed within the mine waste units at locations that will prevent erosion and transport off site, and to encourage establishment of vegetation. The goal is to prevent off site transport of mine waste.

9.3 Improvements to Existing Infiltration Trenches

The current distribution piping within the infiltration trenches was assembled in an ad-hoc manner as the trenches were lengthened, and before consistent operations were identified based on observation of how the systems function. Re-plumbing of the infiltration trenches will improve system reliability by supporting increased ability to isolate specific trench reaches for maintenance while maintaining flow control. The goal is to allow operational changes to be made in response to changing flow conditions, and maintenance requirements while maintaining control of the drainage.

9.4 Subsurface Chemical Amendment

The ultimate goal is to achieve a significant improvement in water quality through reducing metal loading from the Corona Drain tunnel to Kidd Creek. This project will implement a pilot test that will directly measure any benefits attained through introducing chemicals to the source of acid drainage to precipitate metals and interfere with sulfide oxidation processes. The study will generate monitoring data that will allow calculation of the percent metal load reduction through comparison of pre-, during- and post study drainage analytical results and flow measurements. These calculated load reductions would then be used as the basis for design of an implementable subsurface chemical amendment program, and identification of performance goals for full scale implementation of the system.

Precipitates created during subsurface chemical amendment are anticipated to accumulate and be retained within the subsurface, at or near the location where they form.

10.0 Contingency Plans

Contingencies are associated with each of the proposed systems as described below.

10.1 Mine Waste Consolidation Units

If mine waste at a consolidation area is found to be significantly more extensive than can be addressed in the project, any remaining disturbed surfaces on mine waste would be protected using best management practices to prevent run-on and erosion. The disturbed surface would also be revegetated to provide for long term protection from erosion.

10.2 Revegetation

If initial plantings do not succeed, alternative plant varieties will be used in an attempt to increase the amount of vegetation. In addition, the reasons for lack of success will be evaluated and amendments to the revegetation program will be made to encourage subsequent vegetation attempts. Amendments to the plan could include selection of alternate species, limited use of irrigation to help establish plants, and a change to the soil amendments used. Performance standards for revegetation are described in Section 9.2 above.

10.3 Improvements to Existing Infiltration Trenches

Existing plumbing will remain in service to the extent practical so that new plumbing can be tested before entering service. This will be done to prevent the loss of control of mine drainage during replumbing.

10.4 Subsurface Chemical Amendment

A tracer study is necessary to assess the chemical dose rate to be used in the study of subsurface chemical amendment. If the tracer study does not result in positive detection of the tracer, then a connection from the tracer release location and the drain tunnel will not have been established. This could lead to concerns regarding the ultimate fate of the tracer, and inability to conduct pilot scale operations.

The Corona Mine is not located within a groundwater basin used to supply drinking water. The Corona Drain Tunnel was constructed to capture groundwater at the Corona Mine and discharge the captured groundwater to Kidd Creek. Any tracer released within the Corona Mine will be subject to the following potential fates:

- 1) Capture by groundwater flowing to the Corona Drain Tunnel and discharge to Kidd Creek.
- 2) Retention in the geologic materials that occur between the release point and the Corona Drain Tunnel.
- 3) Destructive chemical reactions with the minerals present along the flow path from the release point to the Corona Drain Tunnel.

The tracer to be used will be detergent that contains a brightener chemical, disodium diaminostilbene disulfonate. This substance is non-toxic and is widely used to assess potential discharges from septic systems and water treatment plants to surface water throughout California. If the tracer is not detected in Corona Drain Tunnel drainage, no adverse impact to water quality is anticipated, but pilot operation of the subsurface chemical amendment system will not be performed.

If the tracer is detected in Corona Drain Tunnel drainage, no adverse impact to water quality is anticipated, and the resulting information will be used to plan the subsurface chemical amendment pilot operations.

Pilot operations will include the release of chemicals (sodium hydroxide and ethanol) at rates to be determined based on results of the tracer test, and tracer concentrations measured in drainage. These chemicals will be applied at rates estimated to be sufficient to react with minerals in the drainage source

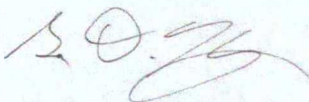
area and result in consumption of the chemicals. The application rates will be determined in part based on the results of the tracer test, and in part on the results of bench scale neutralization tests performed as part of earlier treatability studies using Corona drain tunnel discharge (TKT 2012). The quantities of chemicals anticipated to be used will be small in relation to the volume of drainage discharged from the Corona Drain Tunnel, and are intended to be consumed in chemical reactions along the flow path from the remediation wells to the Corona Drain Tunnel. Thus, discharge of the chemicals to Kidd Creek at concentrations that would impact water quality will be avoided. Drainage from the Corona Drain Tunnel will be monitored for the applied chemicals, metals, and pH to assess the improvements to water quality due to subsurface chemical amendment. This monitoring data would also be used to confirm that no significant impact to water quality is caused by pilot operations.

If the tracer study is not successful, or the pilot operations do not improve water quality sufficiently, then alternate actions at downstream and off-property locations would be evaluated. Such evaluations would assess availability of off property lands for use in treating mine drainage using semi-passive and active neutralization technologies.

11.0 Description of Remediation Agencies Legal Right to Enter and Conduct Remedial Activities

Tuleyome has entered into an access agreement with Corona and Twin Peaks Historical Association, LLC, the property owner. The access agreement grants Tuleyome the legal right to enter the site for the purpose of conducting the remedial activities described herein. A copy of the access agreement is provided in Attachment IV.

12.0 Signature of Authorized Representative of the Remediating Agency



Sara Husby-Good, Executive Director, Tuleyome

13.0 Identification of Pollutants to be addressed by the Remediation Work Plan.

Pollutants addressed by this remediation work plan include mercury, nickel, and sediment. Available site specific information for these pollutants are described in Sections 3 and 4 above.

Implementing this remediation work plan will improve treatment of toxic mine drainage discharging in the Bay-Delta watershed. This project will address the Ecosystem Restoration Program's goal to "Improve and/or maintain water and sediment quality conditions that fully support healthy and diverse

aquatic ecosystems in the Bay-Delta estuary and watershed; and eliminate, to the extent possible, toxic impacts to aquatic organisms, wildlife, and people.”

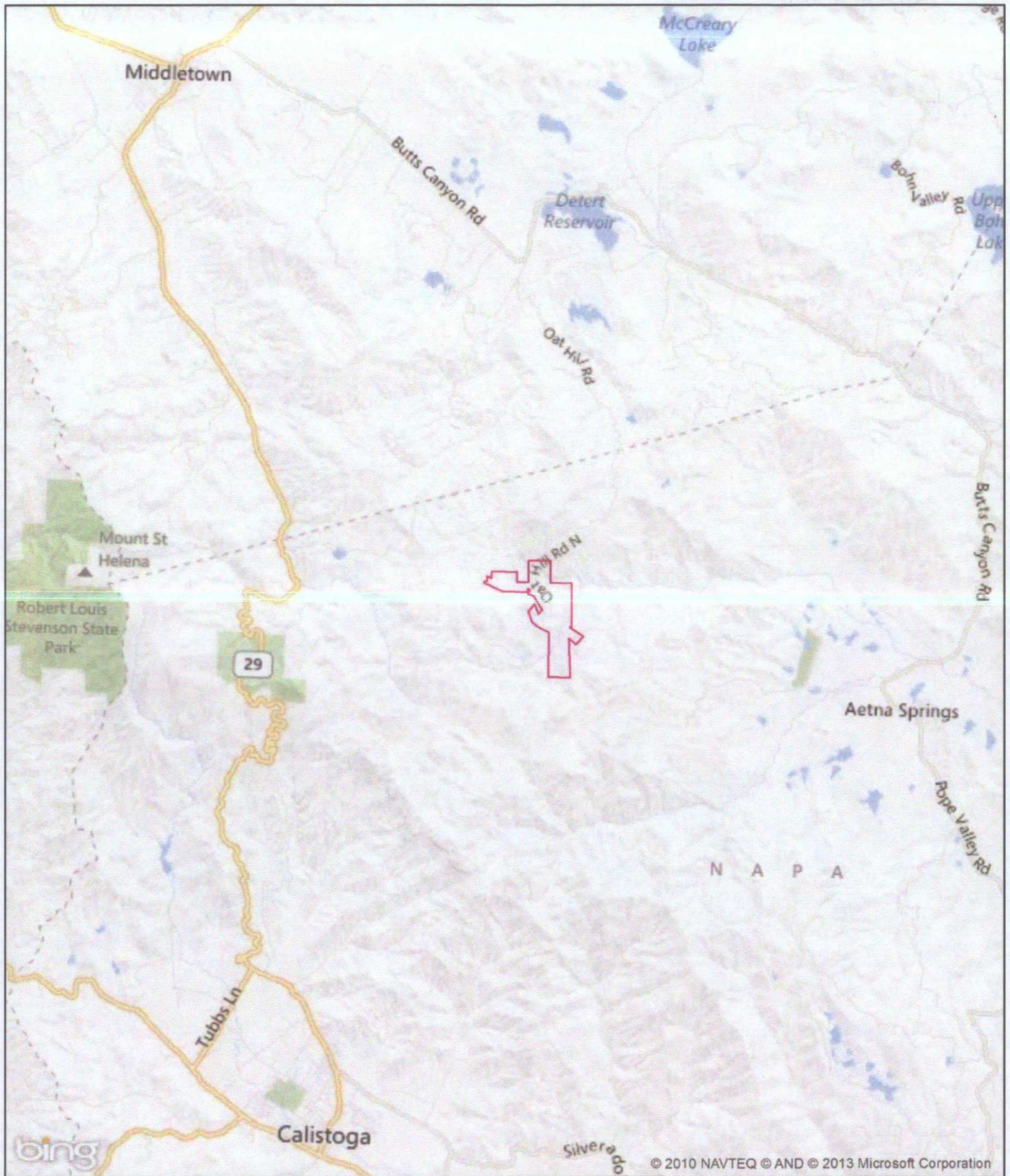
Continuous discharges of drainage water from the two adits are slightly acidic with high concentrations of iron and nickel, and some mercury in the suspended solids. Drainages from the Twin Peaks and the Upper Corona adits have been improved to the point where they no longer discharge into the creek. However, the current improvements are not ideal—difficult to maintain and clogging with iron precipitate. This project will develop and implement a reliable, long-term, maintainable solution for both dissolved nickel and for solids.

This mining legacy contributes to the state’s listing as impaired of James Creek (nickel and mercury), Lake Berryessa (mercury), and lower Putah Creek (mercury and boron). James Creek has been identified as prime trout habitat. A fish consumption advisory is posted for Lake Berryessa and for lower Putah Creek because of fish mercury contamination. Lower Putah Creek is a Wild Trout stream and drains into the Yolo Bypass, a nationally recognized fish rearing, wildlife habitat, farming, and flood control area with some of the highest mercury concentrations in the Bay-Delta.

14.0 References Cited

- EnviroGeo. 2007. Mercury Speciation and Transport from the Twin Peaks and Corona Mines to James Creek, March 2007. October 21.
- MFG. 2002. Technical Report: Former Twin Peaks Mine, Napa County, California. August 16.
- TKT. 2012. April-May Bench Testing Report Twin Peaks and Corona Mine. June.
- US Geological Survey. 2007. Open File Report 2007-1132: Mercury at the Oat Hill Extension Mine and James Creek, Napa County, California: Tailings, Sediment, Water, and Boata, 2003-2004.

Figures
(7 Pages)



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Legend

John Livermore Property



0 0.5 1 2
Miles



Corona Mine & Twin Peaks Mine

Figure 1 - Site Location


Source: Bing Maps roadways web mapping service;
Napa County GIS Department 2012.



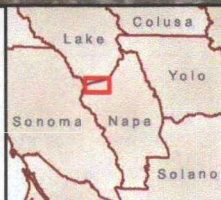
Burleson Consulting, Inc.



Legend

 John Livermore Property

0 370 740 1,480
Feet



Corona Mine & Twin Peaks Mine

Figure 2 - Vicinity Map

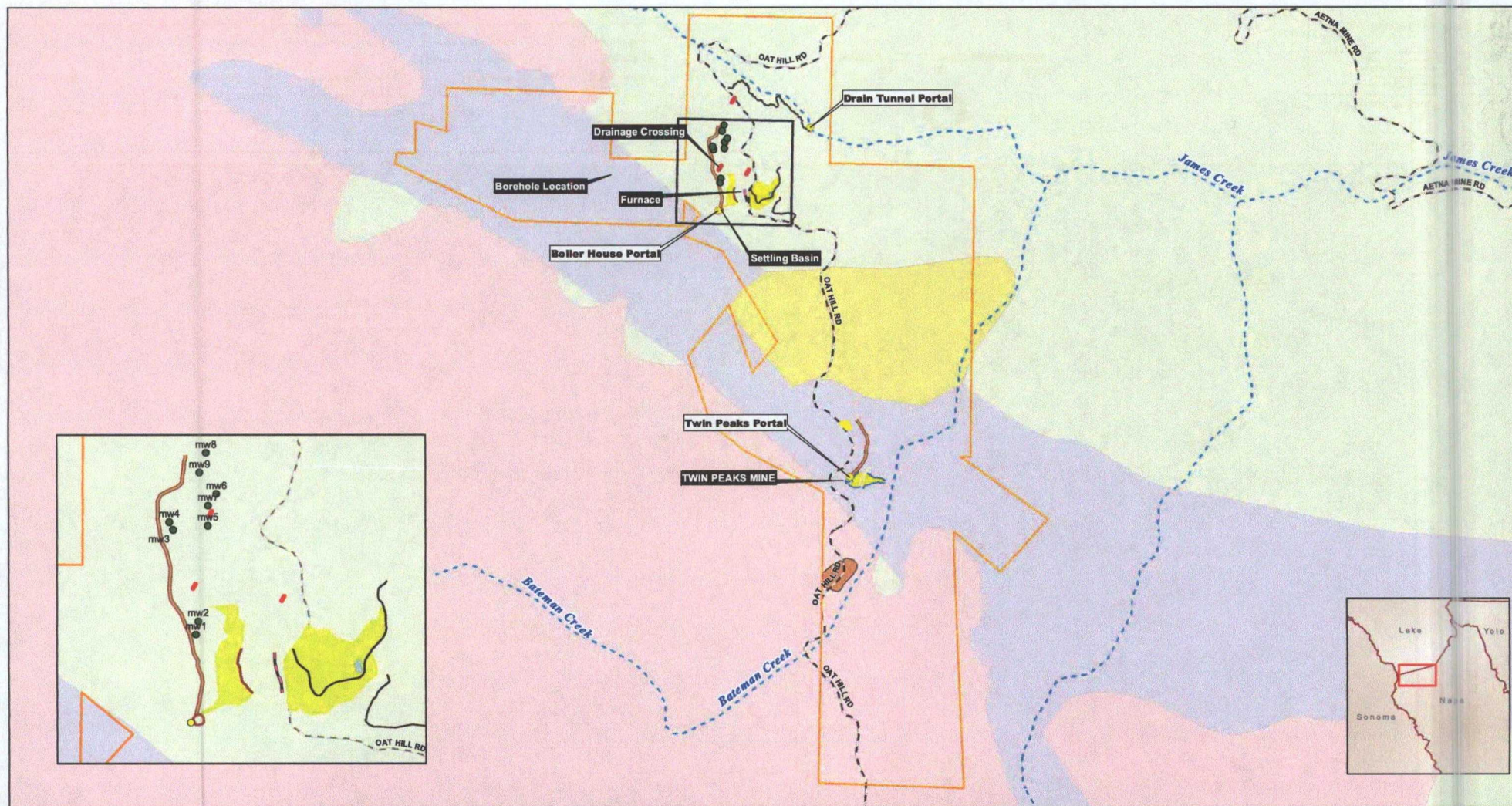
Source: Bing Maps aerial web mapping service;
Napa County GIS Department 2012.



Burleson Consulting, Inc.



<p>Legend</p> <ul style="list-style-type: none"> John Livemore Property Parcels Drain Tunnel Portal Portal 50ft Contour Roads Creeks 	<p>Corona and Twin Peaks Historical Association, LLC Property Asmt#</p> <p>Montesol Property Asmt#</p> <p>Anido Property Asmt#</p> <p>Dixon Property Asmt#</p>	<p>0 245 490 980</p> <p>Feet</p>	<p>Corona Mine & Twin Peaks Mine</p> <p>Figure 3: Parcel Map</p> <p>Source: Bing Maps aerial imagery web mapping service; Napa County GIS Department</p> <p>Burleson Consulting, Inc.</p>
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Legend

- | | | | |
|-------------------------|---------------|--------------------------|------------------------------|
| John Livermore Property | Bench | Existing Path | Existing Infiltration Trench |
| Roads | Existing Path | Existing Rail Track Line | Settling Basin |
| Creeks | Timber Wall | Future Fence | Hunters Camp |
| Portal | Drainage | | Mine Waste |
| Future Gate | | | |
| Monitoring Wells | | | |

Geologic Types

- | |
|---------------------------------------------|
| Jsp - Great Valley Complex serpentinite |
| KJfs - Franciscan Complex sedimentary rocks |
| Qsl - Hillslope Deposits |
| Tpmv - Sonoma Volcanic rocks |



0 495 990 1,980
Feet

Corona & Twin Peaks Mine

Figure 4- Site Features

Source: Bing Maps aerial imagery
web mapping service; USGS 2012;
Napa County GIS Department; 2011;
Burleson Consulting 2013.


Burleson Consulting, Inc.



Corona Mine

Figure 5: Project Features

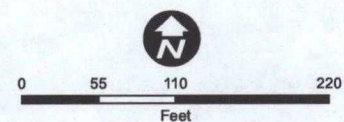
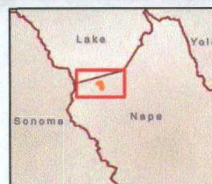
Source: Bing Maps aerial imagery
web mapping service;
Napa County GIS Department 2011;
Burleson Consulting 2012.

 Burleson Consulting, Inc.



Legend


— 50ft Contour	— Existing Infiltration Trench	● Post Diversion Inlet
- - - Roads	— Settling Basin	▲ Post Diversion Outlet
— Creeks	— Approximate Limit of Mine Waste	● Adit
■ Stabilization	— Pre Diversion Drainage	● Portal
■ Revegetation	— BMP	



Twin Peaks Mine

Figure 6: Project Features

Source: Bing Maps aerial imagery
web mapping services
Napa County GIS Department 2011;
Burleson Consulting 2011.

 Burleson Consulting, Inc.

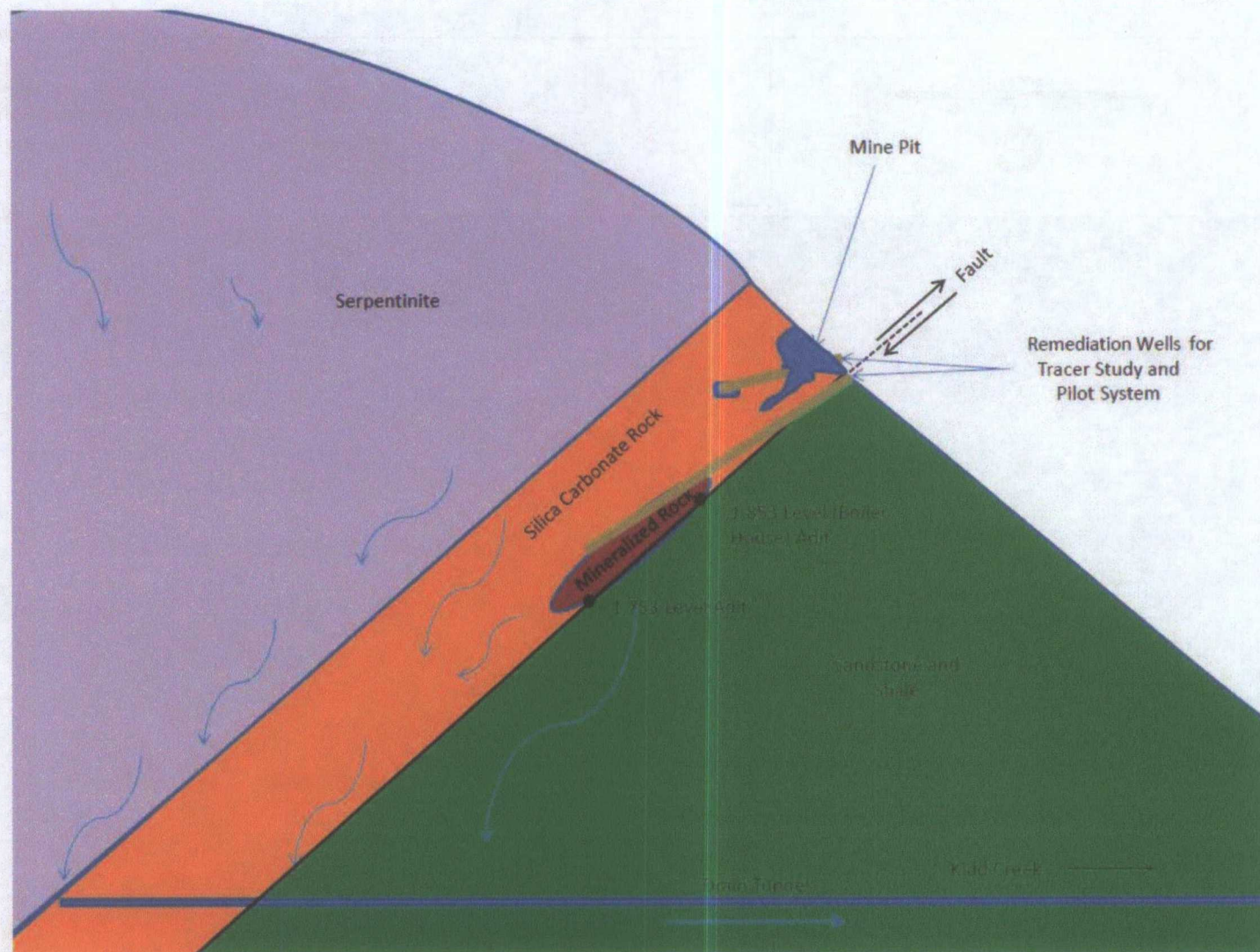


Figure 7

**Corona Mine Diagrammatic
Cross Section**



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TABLES

Table 1: Mine Waste Analytical Results, Corona and Twin Peaks Mercury Mines

Total Metals																	
Sample No.	Location	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	
TP	Twin Peaks Calcines	0.24	12.87	0.20	0.04	194.44	80.12	23.99	1.80	840.00	1235.88	0.00	0.01	0.01	18.50	46.70	
UCWR	Corona Waste Rock	0.48	54.62	0.53	0.05	317.27	33.64	26.21	3.25	250.00	440.09	0.00	0.03	0.03	42.35	60.37	
UCCT	Corona Calcines	0.42	29.53	0.27	0.03	282.48	28.72	24.06	2.79	350.00	467.79	0.00	0.03	0.03	39.62	87.41	
UCCTDUP	Corona Calcines Dup	0.25	21.92	0.18	0.01	183.62	14.05	19.29	2.13	NA	221.75	0.00	0.01	0.01	24.66	62.15	
pgg duplicate UCCT	Corona Calcines Dup	0.44	39.17	0.37	0.02	259.57	27.55	24.14	2.40	260.00	336.96	0.00	0.00	0.03	39.21	49.17	
Total Threshold Limit																	
Concentration		(mg/kg)	500	10,000	75	100	(VI 500)	8,000	2,500	1,000	20	2,000	100	500	700	2,400	5,000
California Waste Extraction Test (WET) Metals																	
Sample No.	Location	Arsenic mg/L	Barium mg/L	Beryllium mg/L	Cadmium mg/L	Chromium mg/L	Cobalt mg/L	Copper mg/L	Lead mg/L	Mercury mg/L	Nickel mg/L	Selenium mg/L	Silver mg/L	Thallium mg/L	Vanadium mg/L	Zinc mg/L	
TP	Twin Peaks Calcines	0.0055	0.161	0.002	0.0005	0.9665	1.9025	0.198	0.01	0.0039	15.55	0.0525	0	0	0.0815	0.2615	
UCWR	Corona Waste Rock	0.0115	0.6475	0.009	0.001	1.372	0.965	0.233	0.0435	0.0046	8.005	0.049	0.0005	0.0005	0.2005	0.5055	
UCCT	Corona Calcines	0.005	0.495	0.004	0	1.1405	0.3795	0.09	0.0295	0.0023	3.6905	0.054	0	0.0005	0.1505	0.1865	
UCCTDUP	Corona Calcines Dup	0.0045	0.436	0.0035	0.0005	0.8225	0.3215	0.1005	0.023	0.0023	2.745	0.029	0.0005	0.0005	0.119	0.1965	
Soluble Threshold																	
Limit Concentration		(mg/L)	5	100	1	1	5 (VI 5)	80	25	5	0.2	20	1	5	7	24	250
Distilled Water Waste Extraction Test (DI WET) Metals																	
Sample No.	Location	Arsenic ug/L	Barium ug/L	Beryllium ug/L	Cadmium ug/L	Chromium ug/L	Cobalt ug/L	Copper ug/L	Lead ug/L	Mercury ug/L	Nickel ug/L	Selenium ug/L	Silver ug/L	Thallium ug/L	Vanadium ug/L	Zinc ug/L	
TP	Twin Peaks Calcines	1.29	55.43	0.46	0.07	188.6	40.14	95.11	3.81	7.624293	1,865	1.58	0	0.03	7.72	12.74	
UCWR	Corona Waste Rock	0.73	67.08	0.55	0.16	193.7	28.88	24.33	3.97	5.312791	1,123	2.36	0	0.02	9.13	29.51	
UCCT	Corona Calcines	0.22	44.26	0.22	0.04	65.38	31.28	11.23	3.07	0.278291	606.4	0	0	0.02	2.44	13.73	
UCCTDUP	Corona Calcines Dup	0.11	19.32	0.1	0.02	21.05	18.81	3.1	0.78	0.038291	260	0	0	0.01	0.77	8.31	
Retardation (unitless)																	
		230	242	4,653	443	10,600,278	60	148	1,591	307	54	325	531	419	5,890	366	

Attachments

- I Implementation Work Plan Outline**
- II Operations, Maintenance, and Monitoring Plan Outline**
- III Mine Waste Revegetation Reference Photographs**
- IV Access Agreement**

**ATTACHMENT I
IMPLEMENTATION PLAN OUTLINE**

ACRONYMS AND ABBREVIATIONS

INTRODUCTION

1.1 LOCATION AND BACKGROUND

1.2 SITE HISTORY

1.3 PREVIOUS INVESTIGATIONS AND RESPONSES

1.4 PURPOSE

2.0 SITE MANAGEMENT PLAN

2.1 KEY PERSONNEL

2.2 COMMUNICATIONS

2.2.1 Operational Communications

2.2.2 Emergency Communications

2.3 SITE SAFETY

2.4 SITE ACCESS AND SECURITY

2.5 SITE PREPARATION, USE, MAINTENANCE, AND PERMITS

2.6 EQUIPMENT AND MATERIALS

2.7 DECONTAMINATION PROCEDURES

2.8 PROJECT SCHEDULE

3.0 REMEDIATION ACTIVITIES

3.1 MOBILIZATION AND SITE PREPARATION

3.2 SUBSURFACE CHEMICAL AMMENDMENT TREATABILITY STUDY

3.2.1 TRACER STUDY

3.2.2 TREATABILITY STUDY

3.3.3 FULL SCALE DESIGN

3.3 CONSOLIDATING/STABILIZING MINE WASTE

3.4 REVEGETATION

**ATTACHMENT I
IMPLEMENTATION PLAN OUTLINE**

- 3.5 SITE STABILIZATION
- 3.6 DEMOBILIZATION
- 3.7 FINAL SITE WALK
- 4.0 CONSTRUCTION QUALITY ASSURANCE PLAN
 - 4.1 CONSTRUCTION COORDINATION AND DELINEATION
 - 4.2 CONSTRUCTION DOCUMENTATION
- 5.0 REFERENCES

ATTACHMENT II
OPERATIONS MAINTENANCE AND MONITORING PLAN OUTLINE
(2 Pages)

1.0 INTRODUCTION

1.2 OM&M Goal and Objectives

1.3 O&M Personnel Roles and Responsibilities

1.3.1 Coordinator

1.4 O&M Cost Estimates

2.0 SITE DESCRIPTION

2.1 Location

2.2 Site Background

2.2 Site Conditions

3.0 SUMMARY OF ENGINEERING CONTROLS

3.1 Best Management Practices

3.2 Revegetation

3.3 Consolidation

3.4 Subsurface Chemical Amendment

4.0 TRAINING

4.1 Hazard Awareness Training Requirements

4.2 Erosion Control Training Requirements

4.3 Vegetation Monitoring Training Requirements

4.4 Surface Water Monitoring Training Requirements

5.0 O&M INSPECTIONS

5.1 Periodic Inspections

5.2 Inspections for Unplanned Events

5.3 Annual Inspections

6.0 ANNUAL REVIEW

7.0 INTRUSIVE WORK ACTIVITIES

7.1 Intrusive Work

7.2 Standard Operating ProcedureS (SOP)

7.3 Health and Safety Requirements

8.0 REPORTING AND RECORD-KEEPING

8.1 Reporting Requirements

8.2 Annual Inspection Summary Reports

8.3 Annual Review Reports

8.4 Notification Timeframes

8.5 Record-Keeping and Retention

9.0 SITE ACCESS

10.0 VARIANCE, MODIFICATION OR TERMINATION OF O&M PLAN

10.1 O&M Plan Variance

10.2 O&M Plan Modifications



10.3 Termination of O&M Plan

11.0 REFERENCES



***Attachment III
Corona and Twin Peaks Vegetation
Reference Photographs***

(3 Pages)


Attachment III
Corona and Twin Peaks Vegetation
Reference Photographs

Photo Number	Photo Description	Photo
B-4	<p>Sparsely vegetated slopes on calcines at Corona Mine, view to east</p> <p>February 22, 2011</p>	
B-5	<p>Sparsely vegetated slopes on calcines at Corona Mine, view to northeast</p> <p>February 22, 2011</p>	

Attachment III
Corona and Twin Peaks Vegetation
Reference Photographs

Photo Number	Photo Description	Photo
<p>TP-1</p>	<p>Slope devoid of vegetation at Twin Peaks. View to northeast.</p> <p>April 19, 2012</p>	
<p>TP-2</p>	<p>Slope devoid of vegetation at Twin Peaks. View to southwest.</p> <p>April 19, 2012</p>	

Attachment III
Corona and Twin Peaks Vegetation
Reference Photographs

Photo Number	Photo Description	Photo
TP-3	<p>Slope devoid of vegetation at Twin Peaks. View to east.</p> <p>April 19, 2012</p>	

Attachment IV
Access Agreement

JOHN LIVERMORE
1755 E. Plumb Ln. #170
Reno, NV 89502
775-786-9955
April 16, 2012

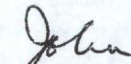
Mr. Bob Schneider
Senior Policy Director
Tuleyome, Inc.
607 North St.
Woodland, CA 95616

Dear Bob:

Enclosed is a signed copy of the Access Agreement for Corona and Twin Peaks.

I have received certificates of insurance from three of the eleven subcontractors and will be interested to find out just what they will be doing. I understand Professor Slotton has already started work on biological uptake in James Creek.

Best regards.


J.S. Livermore

Cc: Sam Livermore

NONEXCLUSIVE TEMPORARY ACCESS LICENSE

THIS NONEXCLUSIVE TEMPORARY ACCESS LICENSE AGREEMENT ("**Agreement**") is entered into, effective as of February 1, 2012, by and between **JOHN S. LIVERMORE**, an individual whose address is c/o Public Resource Associates, 1755 E. Plumb Lane, #170, Reno, NV 89502-3683, tel: (775) 223-9292, email: jslivermore@hughes.net ("**JSL**"), and **TULEYOME, INC.**, a California nonprofit public benefit corporation whose address is 607 North Street, Woodland, CA 95616, and whose primary point of contact is Bob Schneider, Senior Policy Director, tel: 530-304-6215, email: bschneider@tuleyome.org ("**Tuleyome**").

RECITALS

A. JSL is the current fee owner of that certain real property located in the County of Napa, State of California, as more particularly shown on the map attached hereto as **Exhibit A** (the "**JSL Property**").

B. Tuleyome has been awarded grants under the Ecosystem Restoration Program administered by the California Department of Fish & Game to undertake a voluntary mine cleanup project identified as the Corona and Twin Peaks Mine Drainage Treatment Project ("**Project**").

C. To implement the Project, Tuleyome needs temporary access along the road identified as the Oat Hill Mine Road ("**Road**") across property owned by Montesol Company and then across portions of the JSL Property to gain access to the Project site which is also located on the JSL Property ("**Project Site**"), all as indicated on Exhibit A.

D. JSL is willing to grant to Tuleyome and its employees and agents, and specified other parties and their employees and agents with whom Tuleyome may enter into contracts to implement the Project ("**Permitted Parties**"), a temporary license for ingress and egress to and from the Project Site from the date of this License for the duration of the Project ("**License Term**"), subject to the terms and conditions of this License.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereby agree as follows:

LICENSE

1. Grant of License. JSL hereby grants to Tuleyome a nonexclusive temporary license for use of the Project Site, and over the Road for the purposes of ingress and egress to and from the Project Site, by the Permitted Parties during the License Term ("**License**").

2. **Access.** Access under the License may be controlled and restricted pursuant to such protocols as JSL may reasonably establish and communicate to Tuleyome in writing from time to time for the protection of JSL, the JSL Property and the Road, including without limitation the following initial controls and restrictions:

(a) No Permitted Parties other than Tuleyome shall be granted or allowed access under the License unless and until they have been specifically identified, in writing or orally to be promptly followed by a writing (including email), to JSL or a designated agent of JSL ("**Designated Agent**"), and unless and until each such Permitted Party has agreed in writing to be bound by the terms and conditions of the License as set forth in this Agreement. For this purpose, Justin Smith (jsoathill@gmail.com; Home Mobile: (707) 486-6367; Other Phone: (707) 987-9420) is hereby designated JSL's agent.

(b) Access for Permitted Parties shall be limited to purposes of use of the Project Site and ingress and egress to the Project Site directly related to the planning, execution and monitoring of the Project, and not for any other purposes (such as hiking, wood cutting, hunting or any other personal recreation).

(c) Access to the Road and other property owned by JSL is partially controlled by a lockable gate, shown as the "**Table Rock Gate**" on Exhibit A. Tuleyome shall, and Permitted Parties may be, given the combination, keys, gate codes or other means of access through the Table Rock Gate, but the Table Rock Gate shall be kept closed and locked at such times as JSL may specify from time to time. JSL reserves the right to change the combinations, keys, gate codes, and other means of access following reasonable notice to Tuleyome, in which case JSL will provide Tuleyome with replacement combinations, keys, gate codes or other devices to permit continued use of the License by Permitted Parties.

(d) JSL may install and maintain additional gates and/or other security device on the Road or elsewhere on the JSL Property at his sole cost, provided JSL provides Tuleyome with the combinations, keys, access codes, or other means for gaining access through such gates or devices to the extent necessary to permit continued access under the terms of the License.

(e) Permitted Parties shall make reasonable efforts to provide JSL or his Designated Agent at least forty eight (48) hours prior notice of their intent to access the Project Site along the Road, identifying the Permitted Parties and number and type(s) of vehicles to be expected. Any issues relating to the logistics of access under the License shall be coordinated with the Designated Agent.

(f) Access to and use of the Project Site shall be limited to access by foot or by vehicles appropriate for the Road and the Project Site so as to minimize rutting or other damage to the Road or the JSL Property, or the stranding of vehicles unsuitable for the terrain. Access during and following periods of heavy rain may be limited or prohibited by JSL or the Designated Agent if travel along the Road or access to the project Site during such periods, particularly involving heavy vehicles or transporting

supplies or equipment, may be reasonably expected to result in damage to the Road or the JSL Property.

(g) Parking along the Road or elsewhere on JSL Property in a manner that does not permit the ability of other vehicles to pass along the Road shall not be permitted, except in emergency situations or on a temporary basis when unavoidable.

(h) Use of the Road and the Project Site, all access under the License and this Agreement, the Project, and the work in connection with the Project all shall be undertaken and performed in full compliance with all applicable federal, state and local laws and ordinances.

3. **Maintenance and Repair Costs.** During the License Term, Tuleyome shall maintain, and shall cause the Permitted Parties to maintain, the Road (including related drainage ditches and culverts) in substantially the same condition and state of repair as of the date of this Agreement, normal wear and tear excepted. Tuleyome shall, or shall cause such Permitted Party as it may designate to, pay or reimburse JSL for any reasonable costs incurred for the maintenance and repair of the Road during the License Term, except for maintenance and repair costs required due to the negligence, willful misconduct or abuse of the Road by JSL or his employees or agents, or by other third parties who may have access along the Road through permission or license from JSL.

4. **Impairment; Alterations.** Tuleyome agrees not to take, or permit any Permitted Party or other party to take, any action in connection with the Project or access under the License that would impair the value, condition or use of the Road or the JSL Property, except to the extent necessary to execute the Project. Tuleyome shall not, and shall not allow any Permitted Party to, make any alterations, modifications or improvements to the Road without the prior written consent of JSL, or any alterations, modifications or improvements to the Project Site except as expressly contemplated by the Project design or as otherwise approved in writing by JSL.

5. **No Warranties.** The parties acknowledge that (a) the Road is an unpaved, rural and rough road located in steep terrain on private property, and that is not maintained by any federal, state or local agency and does not comply with the road design and safety standards that would apply to a public road, and (b) the Project Site is located in rough and steep terrain. JSL makes no representation or warranty, express or implied, regarding the safety or adequacy of the Road or the Project Site or the purposes for which the License is granted hereunder, and Tuleyome acknowledges that it is not relying upon any statements, representations or warranties made by Montesol or its employees or agents to that effect.

6. **Indemnification.** Tuleyome shall indemnify, hold harmless, defend and protect JSL and his employees, agents, successors and assigns against and from any and all loss, claim, cost, liability, damage, injury, death, or expense, including, without limitation, reasonable attorneys' fees (collectively, "**Damages**"), resulting from, arising out of or in any way connected with use of the Road, the Project Site, the access provided under this

Agreement, the Project, any breach of the License or this Agreement, or any other activities, actions or failures to act, by Tuleyome, any Permitted Party or their respective employees, agents, contractors, subcontractors, invitees, successors or assigns, except for any such Damages resulting solely from the active gross negligence or willful misconduct of JSL or his employees or agents.

7. Insurance.

(a) Tuleyome shall obtain and maintain during the License Term the following insurance coverages:

- Worker's Compensation (and Employer's Liability Insurance) — as required by applicable state statute.
- Commercial General Liability — \$1,000,000 per occurrence for bodily injury, including death and property damage, and \$2,000,000 in the aggregate.
- Automobile Liability — minimum of \$1,000,000 combined single limit for bodily injury and property damage.
- Professional Liability (E&O) and Professional Pollution Liability and Contractors' Pollution Liability — \$1,000,000 each claim and in the aggregate.

(b) All such insurance shall be on an incurrence basis, and shall be placed with a company or companies reasonably satisfactory to Montesol. Such insurance shall insure against all liability of Tuleyome and its employees and agents arising out of and in connection with use of the Road, the Project Site, the License, the Project and performance by Tuleyome of the indemnity provisions of Section 6, all as provided for in this Agreement, and shall be primary as respects JSL such that any insurance maintained by JSL shall be excess of and non-contributory with that of Tuleyome. Each such policy shall provide that it shall not be cancelled or changed in coverage or scope except upon at least thirty (30) days prior written notice to JSL. Certificates of insurance, showing JSL and his employees and agents as additional named insureds shall be delivered to JSL promptly following execution of this Agreement and upon reasonable request periodically thereafter during the License Term.

(c) In addition to the above insurance requirements, Licensee shall include all Permitted Parties as additional named insureds under its policies, or shall require all Permitted Parties to provide all insurance coverages as described above and certificates of insurance evidencing the same.

8. Property Taxes. All real property taxes and assessments for the JSL Property, the Road and the Project Site shall be borne by JSL; provided that Tuleyome shall pay, or shall cause the appropriate Permitted Party to pay, any fees, costs, assessments or

increases in property taxes imposed on JSL, the JSL Property, the Project Site or the Road in connection with or as a result of the Project or any related actions of any Permitted Party.

9. **Term.** This Agreement shall continue in full force and effect during the License Term, unless this Agreement is amended, modified or terminated by an agreement executed and delivered by the parties hereto.

10. **No Public Dedications; No Recording.** Nothing in this Agreement is intended to be or shall be deemed or construed to be a gift or dedication of any portion of the Road, the Project Site or any other portion of the JSL Property to Tuleyome or any other party for any public use or nonprofit benefit purpose (unless and until any such gift or dedication is implemented by separate agreement). This Agreement shall not be recorded.

11. **No Third Party Beneficiaries.** This Agreement is only for the benefit of the parties hereto and their successors-in-interest or permitted assigns as set forth in this Agreement. No other person or entity or property shall be entitled to rely hereon, receive any benefit herefrom or enforce any provision hereof against any party hereto (or the permitted assigns of Tuleyome or successors-in-title to JSL, respectively).

12. **Notices.** Any notice required or permitted to be given under this Agreement shall be in writing (which may include electronic means) and shall be deemed to have been delivered when received by personal delivery or electronically, or on the date two days after being deposited by registered or certified mail, postage prepaid, return receipt requested, or with Federal Express or a comparable courier, and addressed as set forth above (or such other address or email contact as either party may specify to the other by notice meeting the conditions of this Section 12).

13. **Binding Effect; No Assignment; Governing Law.** This Agreement and all covenants and restrictions contained herein shall, to the fullest extent permitted by law and equity and without regard to technical classifications or designations, be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns. Without the prior written consent of JSL, Tuleyome may not assign its rights or benefits under this Agreement to any third party, except to Permitted Parties to the extent provided herein, or with the prior written consent of JSL or his successor-in-title to the JSL Property. This Agreement shall be governed and construed in accordance with the laws of the State of California.

14. **Severability.** If any one or more of the provisions contained in this Agreement is for any reason held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provisions of this Agreement, and this Agreement shall be construed as if such invalid, illegal or unenforceable provision had never been contained in this Agreement.

15. **Construction.** The parties acknowledge that each party and its counsel have reviewed this Agreement and that the normal rule of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be employed in the interpretation of this Agreement or any amendments or exhibits.

16. **Attorneys' Fees.** In the event that either party to this Agreement shall bring legal action in order to enforce any of its provisions, the prevailing party shall be entitled to recover from the other party the reasonable attorneys' fees and costs incurred by the prevailing party in enforcing its rights under this Agreement.

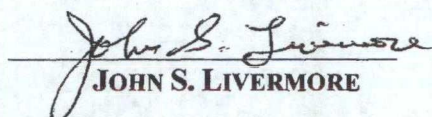
17. **Entire Agreement.** This Agreement, including the recitals and the attached Exhibit A, constitutes the entire agreement between the parties with respect to the grant of the License and all matters to the License and use of the Road and the Project Site.

18. **Amendments.** This Agreement may be amended, modified or supplemented only by a written document executed by all of the parties hereto.

19. **Counterparts.** This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

IN WITNESS WHEREOF, the parties have executed this Nonexclusive Temporary Access License Agreement effective as of the date first above written.

"JSL"


JOHN S. LIVERMORE

"TULEYOME"

TULEYOME, INC.
a California nonprofit public benefit corporation

By:

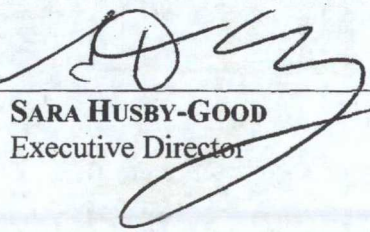
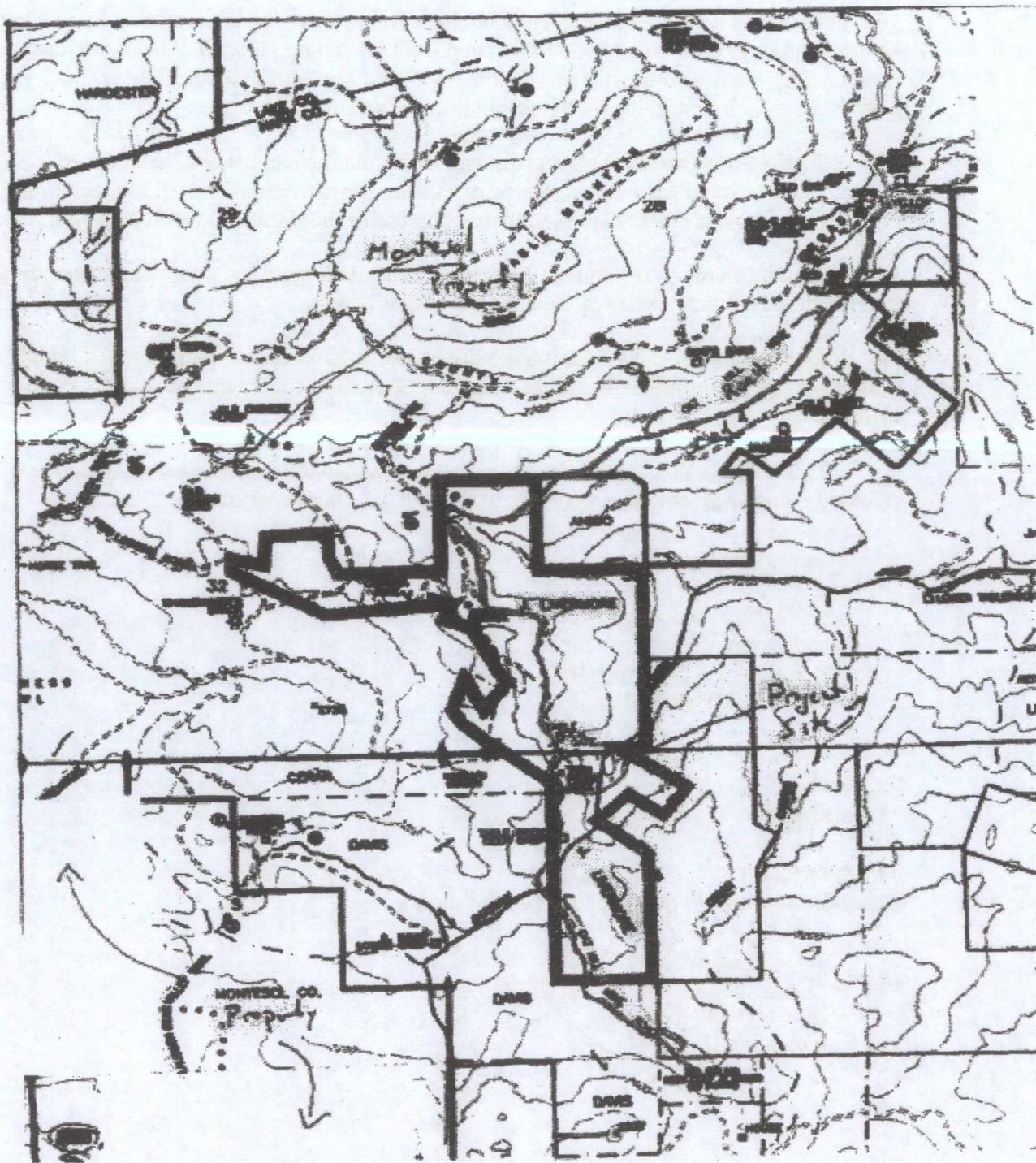

SARA HUSBY-GOOD
Executive Director

EXHIBIT A
To
NONEXCLUSIVE ACCESS LICENSE AGREEMENT



NONEXCLUSIVE TEMPORARY ACCESS LICENSE

THIS NONEXCLUSIVE TEMPORARY ACCESS LICENSE AGREEMENT ("**Agreement**") is entered into, effective as of February 1, 2012, by and between **NORMAN B. LIVERMORE & SONS**, a California general partnership dba Montesol Company whose address is c/o Benson & Neff, One Post Street, Suite 2150, San Francisco, CA 94104-5206, and whose primary point of contact is Samuel M. Livermore, Managing Partner, tel: 415-693-2113, email: slivermore@cooley.com ("**Montesol**"), and **TULEYOME, INC.**, a California nonprofit public benefit corporation whose address is 607 North Street, Woodland, CA 95616, and whose primary point of contact is Bob Schneider, Senior Policy Director, tel: 530-304-6215, email: bschneider@tuleyome.org ("**Tuleyome**").

RECITALS

A. Montesol is the current fee owner of that certain real property located in the County of Napa, State of California, as more particularly shown on the map attached hereto as **Exhibit A** (the "**Montesol Property**").

B. Tuleyome has been awarded grants under the Ecosystem Restoration Program administered by the California Department of Fish & Game to undertake a voluntary mine cleanup project identified as the Corona and Twin Peaks Mine Drainage Treatment Project ("**Project**").

C. To implement the Project, Tuleyome needs temporary access across the Montesol Property along the road identified as the Oat Hill Mine Road ("**Road**") to gain access to the Project site ("**Project Site**") located on the property of John S. Livermore ("**JSL**"), all as indicated on Exhibit A.

D. Montesol is willing to grant to Tuleyome and its employees and agents, and specified other parties and their employees and agents with whom Tuleyome may enter into contracts to implement the Project ("**Permitted Parties**"), a temporary license for ingress and egress to and from the Project Site from the date of this License for the duration of the Project ("**License Term**"), subject to the terms and conditions of this License.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereby agree as follows:

LICENSE

1. Grant of License. Montesol hereby grants to Tuleyome a nonexclusive temporary license over the Road for the purposes of ingress and egress to and from the Project Site by the Permitted Parties during the License Term ("**License**").

2. **Access.** Access under the License may be controlled and restricted pursuant to such protocols as Montesol may reasonably establish and communicate to Tuleyome in writing from time to time for the protection of Montesol and its partners, employees and agents, the Montesol Property and the Road, including without limitation the following initial controls and restrictions:

(a) No Permitted Parties other than Tuleyome shall be granted or allowed access under the License unless and until they have been specifically identified, in writing or orally to be promptly followed by a writing (including email), to the Managing Partner of Montesol or a designated agent of Montesol ("**Designated Agent**"), and unless and until each such Permitted Party has agreed in writing to be bound by the terms and conditions of the License as set forth in this Agreement. For this purpose, Justin Smith (jsoathill@gmail.com; Home Mobile: (707) 486-6367; Other Phone: (707) 987-9420) is hereby designated Montesol's agent.

(b) Access for Permitted Parties shall be limited to purposes of ingress and egress directly related to the planning, execution and monitoring of the Project, and not for any other purposes (such as hiking, wood cutting, hunting or any other personal recreation).

(c) Access to the Road and other property owned by Montesol is controlled by a locked gate, shown as the "**Yellow Gate**" on Exhibit A. Tuleyome shall, and Permitted Parties may be, given the combination, keys, gate codes or other means of access through the Yellow Gate, but the Yellow Gate shall be kept closed and locked at all times. Montesol reserves the right to change the combinations, keys, gate codes, and other means of access following reasonable notice to Tuleyome, in which case Montesol will provide Tuleyome with replacement combinations, keys, gate codes or other devices to permit continued use of the License by Permitted Parties.

(d) Montesol may install and maintain additional gates and/or other security device on the Road at its sole cost, provided Montesol provides Tuleyome with the combinations, keys, access codes, or other means for gaining access through such gates or devices as necessary to permit continued access under the terms of the License.

(e) Permitted Parties shall make reasonable efforts to provide Montesol or its Designated Agent at least forty eight (48) hours prior notice of their intent to access the Project Site along the Road, identifying the Permitted Parties and number and type(s) of vehicles to be expected. Any issues relating to the logistics of access under the License shall be coordinated with the Designated Agent.

(f) Access shall be limited to travel by foot or by vehicles appropriate for the Road so as to minimize rutting or other damage to the Road, or the stranding of vehicles unsuitable for the terrain. Access during and following periods of heavy rain may be limited or prohibited by Montesol or the Designated Agent if travel along the Road during such periods, particularly involving heavy vehicles or transporting supplies or equipment, may be reasonably expected to result in damage to the Road.

(g) Parking along the Road or elsewhere on Montesol Property shall not be permitted, except in emergency situations

(h) Use of the Road, all access under the License and this Agreement, the Project, and the work in connection with the Project all shall be undertaken and performed in full compliance with all applicable federal, state and local laws and ordinances.

3. Maintenance and Repair Costs. During the License Term, Tuleyome shall maintain, and shall cause the Permitted Parties to maintain, the Road (including related drainage ditches and culverts) in substantially the same condition and state of repair as of the date of this Agreement, normal wear and tear excepted. Tuleyome shall, or shall cause such Permitted Party as it may designate to, pay or reimburse Montesol for any reasonable costs incurred for the maintenance and repair of the Road during the License Term, except for maintenance and repair costs required due to the negligence, willful misconduct or abuse of the Road by Montesol or its employees or agents, or by other third parties who may have access along the Road through permission or license from Montesol.

4. Impairment; Alterations. Tuleyome agrees not to take, or permit any Permitted Party or other party to take, any action in connection with the Project or access under the License that would impair the value, condition or use of the Road or the Montesol Property. Tuleyome shall not, and shall not allow any Permitted Party to, make any alterations, modifications or improvements to the Road without the prior written consent of Montesol.

5. No Warranties. The parties acknowledge that the Road is an unpaved, rural and rough road located in steep terrain on private property, and that is not maintained by any federal, state or local agency and does not comply with the road design and safety standards that would apply to a public road. Montesol makes no representation or warranty, express or implied, regarding the safety or adequacy of the Road for the purposes for which the License is granted hereunder, and Tuleyome acknowledges that it is not relying upon any statements, representations or warranties made by Montesol or its employees or agents to that effect.

6. Indemnification. Tuleyome shall indemnify, hold harmless, defend and protect Montesol and its partners, employees, agents, successors and assigns against and from any and all loss, claim, cost, liability, damage, injury, death, or expense, including, without limitation, reasonable attorneys' fees (collectively, "**Damages**"), resulting from, arising out of or in any way connected with use of the Road, the access provided under this Agreement, the Project, any breach of the License or this Agreement, or any other activities, actions or failures to act, by Tuleyome, any Permitted Party or their respective employees, agents, contractors, subcontractors, invitees, successors or assigns, except for any such Damages resulting solely from the active gross negligence or willful misconduct of Montesol or its employees or agents.

7. Insurance.

(a) Tuleyome shall obtain and maintain during the License Term the following insurance coverages:

- Worker's Compensation (and Employer's Liability Insurance) — as required by applicable state statute.
- Commercial General Liability — \$1,000,000 per occurrence for bodily injury, including death and property damage, and \$2,000,000 in the aggregate.
- Automobile Liability — minimum of \$1,000,000 combined single limit for bodily injury and property damage.
- Professional Liability (E&O) and Professional Pollution Liability and Contractors' Pollution Liability — \$1,000,000 each claim and in the aggregate.

(b) All such insurance shall be on an incurrence basis, and shall be placed with a company or companies reasonably satisfactory to Montesol. Such insurance shall insure against all liability of Tuleyome and its employees and agents arising out of and in connection with use of the Road, the License, the Project and performance by Tuleyome of the indemnity provisions of Section 6, all as provided for in this Agreement, and shall be primary as respects Montesol such that any insurance maintained by Montesol shall be excess of and non-contributory with that of Tuleyome. Each such policy shall provide that it shall not be cancelled or changed in coverage or scope except upon at least thirty (30) days prior written notice to Montesol. Certificates of insurance, showing Montesol and its partners, employees and agents as additional named insureds shall be delivered to Montesol promptly following execution of this Agreement and upon reasonable request periodically thereafter during the License Term.

(c) In addition to the above insurance requirements, Licensee shall include all Permitted Parties as additional named insureds under its policies, or shall require all Permitted Parties to provide all insurance coverages as described above and certificates of insurance evidencing the same.

8. Property Taxes. All real property taxes and assessments for the Montesol Property and the Road shall be borne by Montesol; provided that Tuleyome shall pay, or shall cause the appropriate Permitted Party to pay, any fees, costs, assessments or increases in property taxes imposed on Montesol, the Montesol Property or the Road in connection with or as a result of the Project or any related actions of any Permitted Party.

9. Term. This Agreement shall continue in full force and effect during the License Term, unless this Agreement is amended, modified or terminated by an agreement executed and delivered by the parties hereto.

10. No Public Dedications; No Recording. Nothing in this Agreement is intended to be or shall be deemed or construed to be a gift or dedication of any portion of the Road or any other portion of the Montesol Property to Tuleyome or any other party for any public use or nonprofit benefit purpose. This Agreement shall not be recorded.

11. No Third Party Beneficiaries. This Agreement is only for the benefit of the parties hereto and their successors-in-interest or permitted assigns as set forth in this Agreement. No other person or entity or property shall be entitled to rely hereon, receive any benefit herefrom or enforce any provision hereof against any party hereto (or the permitted assigns of Tuleyome or successors-in-title to Montesol, respectively).

12. Notices. Any notice required or permitted to be given under this Agreement shall be in writing (which may include electronic means) and shall be deemed to have been delivered when received by personal delivery or electronically, or on the date two days after being deposited by registered or certified mail, postage prepaid, return receipt requested, or with Federal Express or a comparable courier, and addressed as set forth above (or such other address or email contact as either party may specify to the other by notice meeting the conditions of this Section 11).

13. Binding Effect; No Assignment; Governing Law. This Agreement and all covenants and restrictions contained herein shall, to the fullest extent permitted by law and equity and without regard to technical classifications or designations, be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns. Without the prior written consent of Montesol, Tuleyome may not assign its rights or benefits under this Agreement to any third party, except to Permitted Parties to the extent provided herein, or with the prior written consent of Montesol or its successor-in-title to the Montesol Property. This Agreement shall be governed and construed in accordance with the laws of the State of California.

14. Severability. If any one or more of the provisions contained in this Agreement is for any reason held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provisions of this Agreement, and this Agreement shall be construed as if such invalid, illegal or unenforceable provision had never been contained in this Agreement.

15. Construction. The parties acknowledge that each party and its counsel have reviewed this Agreement and that the normal rule of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be employed in the interpretation of this Agreement or any amendments or exhibits.

16. Attorneys' Fees. In the event that either party to this Agreement shall bring legal action in order to enforce any of its provisions, the prevailing party shall be entitled to recover from the other party the reasonable attorneys' fees and costs incurred by the prevailing party in enforcing its rights under this Agreement.

17. **Entire Agreement.** This Agreement, including the recitals and the attached Exhibit A, constitutes the entire agreement between the parties with respect to the grant of the License and all matters to the License and use of the Road.

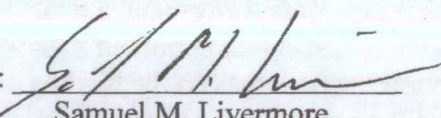
18. **Amendments.** This Agreement may be amended, modified or supplemented only by a written document executed by all of the parties hereto.

19. **Counterparts.** This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

IN WITNESS WHEREOF, the parties have executed this Nonexclusive Temporary Access License Agreement effective as of the date first above written.

"MONTESOL"

NORMAN B. LIVERMORE & SONS,
a California general partnership, dba Montesol Company

By: 
Samuel M. Livermore
Managing Partner

"TULEYOME"

TULEYOME, INC.
a California nonprofit public benefit corporation

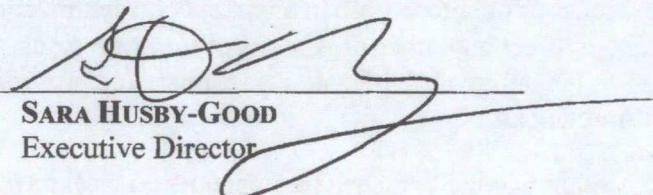
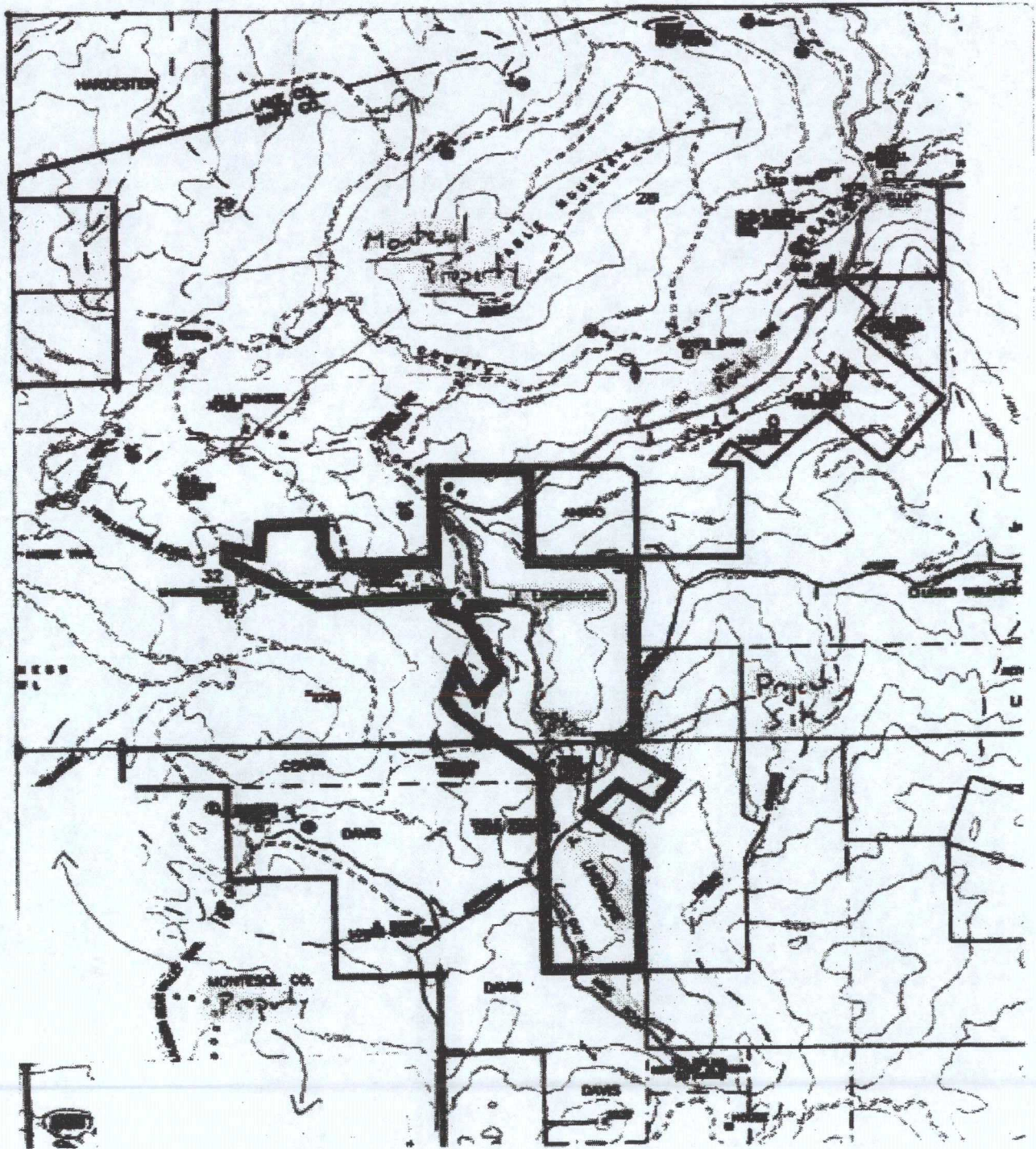
By: 
SARA HUSBY-GOOD
Executive Director

EXHIBIT A
To
NONEXCLUSIVE ACCESS LICENSE AGREEMENT



APPENDIX 3



SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Project Name: Corona and Twin Peaks Mercury Mines	Project Manager: Sara Husby, Tuleyome	Telephone: (530) 350-2599												
Location: Napa County, California	Client Contact: Stephen McCord, McCord Environmental	Telephone: (530) 220-3165												
EPA I.D. No. Not applicable	Prepared By: Greg Reller, Burleson Inc.	Date: January 13, 2016												
Project No. ERP Grant E1596004	Date of Activities: January 2016 – December 2018													
Objectives: The project objectives are to investigate and mitigate drainage from the Boiler House Adit, Twin Peaks Adit, and Corona Drain tunnel; characterize mine wastes on slopes near each of the portals; install bat gates; and assess the presence of mercury vapors at the Corona furnace. The project will include: site visits, various site surveys including biological and cultural surveys, grading and construction activities, soil and waste sampling, and water sampling.														
Site Type: Check as many as applicable. <table border="0"><tr><td><input type="checkbox"/> Active</td><td><input type="checkbox"/> Landfill</td><td><input type="checkbox"/> Residential</td></tr><tr><td><input checked="" type="checkbox"/> Inactive</td><td><input type="checkbox"/> Railroad</td><td><input type="checkbox"/> Industrial</td></tr><tr><td><input type="checkbox"/> Secured</td><td><input type="checkbox"/> Uncontrolled</td><td><input type="checkbox"/> Urban</td></tr><tr><td><input checked="" type="checkbox"/> Unsecured</td><td><input checked="" type="checkbox"/> Controlled</td><td><input checked="" type="checkbox"/> Other (specify)</td></tr></table> <p>Site Access is controlled by a locking gate.</p> <p>Abandoned mine, the closest residents are approximately two miles northwest of the mine site. Steep grade.</p>			<input type="checkbox"/> Active	<input type="checkbox"/> Landfill	<input type="checkbox"/> Residential	<input checked="" type="checkbox"/> Inactive	<input type="checkbox"/> Railroad	<input type="checkbox"/> Industrial	<input type="checkbox"/> Secured	<input type="checkbox"/> Uncontrolled	<input type="checkbox"/> Urban	<input checked="" type="checkbox"/> Unsecured	<input checked="" type="checkbox"/> Controlled	<input checked="" type="checkbox"/> Other (specify)
<input type="checkbox"/> Active	<input type="checkbox"/> Landfill	<input type="checkbox"/> Residential												
<input checked="" type="checkbox"/> Inactive	<input type="checkbox"/> Railroad	<input type="checkbox"/> Industrial												
<input type="checkbox"/> Secured	<input type="checkbox"/> Uncontrolled	<input type="checkbox"/> Urban												
<input checked="" type="checkbox"/> Unsecured	<input checked="" type="checkbox"/> Controlled	<input checked="" type="checkbox"/> Other (specify)												
Initial Site information The Corona and Twin Peaks mercury mines were active intermittently from the 1860s to the 1960s. The site consists of two draining adits (Boiler House, and Twin Peaks), a drain tunnel (Corona Drain), and associated waste rock and tailings. Drainage from the Boiler House and Twin Peaks portals is controlled by diversion to infiltration ditches. Drainage from the Corona Drain Tunnel discharges to Kidd Creek, an ephemeral stream. The sites are on adjacent private parcels along Oat Hill Road. Topography is steep, and slopes are forested except where disturbed by historical mining. Note: Figures are provided at end of plan. The focus of project field efforts will include: <ol style="list-style-type: none">1. Sampling of soil, mine waste, and water2. Site Stabilization, mine waste consolidation and revegetation3. Bat gate installation and other fences4. Infiltration trench improvements5. Dosing chemicals for in situ and ex situ treatment6. Pipeline installation7. Shallow trenching8. Drilling and Well installation Wind Speed and Direction (Approach from upwind): Not available (NA) Temperature (°F): Wet, cool winters, and warm, dry summers Precipitation: Average annual precipitation of 36 inches. January is the wettest month. Forecast: NA														





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Contaminants of Concern

The contaminants of concern include mercury and nickel in water and soil.

The drainage from the adits is acidic and contains iron and nickel at high concentrations.

Isolation and Protection Action Zones Based on Air Monitoring Results: Stay away from mine related apparatus, such as furnaces, where concentrations of mercury would be highest in soil. Do not enter adits; recent air monitoring showed concentrations of mercury vapor exceeded exposure levels only in close proximity to historical furnaces. Confined space entry is not required.

Waste Type: ☒ Liquid ☒ Solid ☒ Sludge ☐ Gas ☐ Unknown

Waste Characteristics: Check as many as applicable.

<input checked="" type="checkbox"/> Corrosive	<input type="checkbox"/> Flammable	<input type="checkbox"/> Unknown
<input checked="" type="checkbox"/> Toxic	<input checked="" type="checkbox"/> Volatile	<input type="checkbox"/> Peroxide forming
<input type="checkbox"/> Inert	<input type="checkbox"/> Reactive	<input type="checkbox"/> Other (specify)
<input type="checkbox"/> Ignitable	<input type="checkbox"/> Radioactive	<input type="checkbox"/> Other (specify)

Hazard(s) of Concern: Check as many as applicable.

<input checked="" type="checkbox"/> Heat stress	<input type="checkbox"/> Overhead utilities
<input checked="" type="checkbox"/> Cold stress	<input type="checkbox"/> Confined space(s)
<input type="checkbox"/> Explosion or fire hazard	<input checked="" type="checkbox"/> Noise (During construction wear ear protection)
<input type="checkbox"/> Oxygen deficiency	<input checked="" type="checkbox"/> Biological hazard: poison oak, wildlife (e.g., black bears, skunks, bobcats, mountain lions), rattlesnakes, ticks, giardia
<input type="checkbox"/> Radiological hazard	<input checked="" type="checkbox"/> Inorganic chemicals
<input type="checkbox"/> Underground storage tanks	<input checked="" type="checkbox"/> Organic chemicals
<input checked="" type="checkbox"/> Surface tanks	<input checked="" type="checkbox"/> Heavy equipment
<input type="checkbox"/> Buried utilities	<input checked="" type="checkbox"/> Other (specify) Unauthorized target shooting area, forest fires, naturally occurring asbestos, adverse weather conditions. Steep terrain.

Explosion or Fire Potential: ☐ High ☐ Medium ☒ Low ☐ Unknown





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Chemical Products Project Team Will Use or Store On Site: (Attach a Material Safety Data Sheet [MSDS] for each item.)

- | | | | |
|---------------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------|
| <input checked="" type="checkbox"/> Alconox or Liquinox | <input checked="" type="checkbox"/> Ethanol | <input type="checkbox"/> Hexane | <input type="checkbox"/> Calibration gas (Methane) |
| <input type="checkbox"/> Hydrochloric acid (HCl) | <input checked="" type="checkbox"/> SulphoRhodamine B dye | <input type="checkbox"/> Household bleach (NaOCl) | <input type="checkbox"/> Hazcat Kit |
| <input checked="" type="checkbox"/> Nitric acid (HNO ₃) | <input type="checkbox"/> Calibration gas (Pentane) | <input type="checkbox"/> Sulfuric acid (H ₂ SO ₄) | <input type="checkbox"/> Mark I Kits (number?) _____ |
| <input checked="" type="checkbox"/> Sodium hydroxide (NaOH) | <input type="checkbox"/> Hydrogen gas | <input type="checkbox"/> Acetic acid | <input type="checkbox"/> Other (specify) _____ |

Site Hazards/Activities:

Check as many as applicable

- ☒ General Safe Work Practices
- ☐ Control of Hazardous Energy Sources (Lockout/Tagout)
- ☒ Safe Drilling Practices
- ☒ Excavation Practices
- ☐ Working Over or Near Water
- ☐ Hot Work Practices
- ☒ Special Site Hazards
- ☐ Safe Electrical Work Practices
- ☐ Fall Protection Practices
- ☐ Portable Ladder Safety
- ☐ Drum and Container Handling Practices
- ☐ Shipping Dangerous Goods
- ☐ Flammable Hazards and Ignition Sources
- ☒ Spill and Discharge Control Practices
- ☒ Heat Stress
- ☒ Cold Stress
- ☒ Biohazards
- ☐ Underground Storage Tank Removal Practices
- ☒ Work Around Heavy Equipment
- ☐ Respirator Cleaning Procedures
- ☐ Safe Work Practices for Use of Air Purifying Respirators
- ☐ Respirator Qualitative Fit Testing Procedures

Burleson Employee Training and Medical Requirements:

Basic Training and Medical

- ☒ Initial 40 Hour Training
- ☐ 8-Hour Supervisor Training (one-time)
- ☒ Current 8-Hour Refresher Training
- ☐ Current Medical Clearance (including respirator use)
- ☒ Current First Aid Training (minimum 1 Burleson employee on site)
- ☒ Current CPR Training (minimum 1 Burleson employee on site)

Other Specific Training

- ☐ Confined Space Training
- ☐ Level A Training
- ☐ Radiation Training
- ☐ Atropine (Nerve Agent Antidote) Injector Training
- ☐ Other _____





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Materials Present or Suspected at Site	Highest Observed Concentration (specify units and media)	PEL/TLV Exposure Limit (specify ppm or mg/m ³)	IDLH Level (specify ppm or mg/m ³)	Primary Hazards of the Material (explosive, flammable, corrosive, toxic, volatile, radioactive, biohazard, oxidizer, etc.)	Symptoms and Effects of Acute Exposure	Photo-ionization Potential (eV)
Mercury	0.039 mg/m ³ air inside brick furnace	0.1 mg/m ³ -air/0.025 mg/m ³ -air	10 mg/m ³ (as Hg)	Toxic	Acute exposure to high concentrations of mercury vapor causes severe respiratory damage, while chronic exposure to lower levels is primarily associated with central nervous system damage	NA
Nickel	5.8 mg/L (Corona Drain Tunnel drainage)	0.1 mg/m ³ (inhalable fraction)	Ca [10 mg/m ³ (as Ni)]	Toxic	Sensitization dermatitis, allergic asthma, pneumonitis; lung damage; nasal cancer	NA
Information Source(s): <ul style="list-style-type: none">Site information provided by the client.Chemical information from: OSHA/EPA Occupational Chemical Database: http://www.osha.gov/SLTC/healthguidelines/index.html http://www.cdc.gov/niosh/idlh/intridl4.html						

Note: Use the following short forms to complete the table above.

IDLH = Immediately dangerous to life or health
mg/m³ = Milligram per cubic meter

PEL = Permissible exposure limit
ppm = Part per million
TLVL = Threshold limit value
Ca = carcinogen,





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Field Activities Covered Under This Plan:									
Task Description:	Level of Protection ¹								Date of Activities
	Primary				Contingency				
1. Sampling of soil, mine waste, and water; Biological surveys	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	
2. Site Stabilization, mine waste consolidation and revegetation	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	
3. Bat gate installation and other fences	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	
4. Infiltration trench improvements	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	
5. Dosing chemicals for in situ and ex situ treatment	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	
6. Pipeline installation	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	
7. Shallow trenching	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	
8. Drilling and well installation	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D	
Site Personnel and Responsibilities (include subcontractors):									
Employee Name	Task(s)			Responsibilities					
Stephen McCord, McCord Environmental	All			<ul style="list-style-type: none"> Project Manager or Field Team Leader: Directs project site activities, makes site safety coordinator (SSC) aware of pertinent project developments and plans, and maintains communications with client as necessary. 					
Other Team Consultants	All			<ul style="list-style-type: none"> Field Personnel: Completes tasks as directed by the project manager, field team leader, and SSC, and follows all procedures and guidelines established in activity specific Health and Safety Manual. 					
Greg Reller, Burleson Consulting, Inc. Chris Scudder, Burleson Consulting, Inc.	All			<ul style="list-style-type: none"> Health and Safety Officer: Completes tasks as directed by the project manager, field team leader, and SSC, and follows all procedures and guidelines established in the activity specific Health and Safety Manual. 					
Other Team Consultants	All			<ul style="list-style-type: none"> Directs laboratory scale treatability studies to identify an appropriate semi-passive technology for future field-scale trials at the site. 					

Note: ¹ See next page for details regarding levels of protection





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Protective Equipment: (Indicate type or material as necessary for each task.)				
Task	Primary Level of Protection (A,B,C,D)	PPE Component Description (Primary)	Contingency Level of Protection (A, B, C, D)	PPE Component Description (Contingency)
1	D	CPC material:	D	If on-site observation indicates potentially unsafe work conditions, work will stop and appropriate engineering controls will be implemented to remove the unsafe condition(s). If engineering controls are not effective, work will stop until increased levels of protection are identified and properly implemented.
2	D	Glove material(s): Leather, Nitrile or Latex when in contact with contaminated materials (water and soil)	D	
3	D		D	
4	D	Boot material: Leather with reinforced toe and steel shank	D	
5	D	Hard hat: When working around heavy equipment or if there is an overhead hazard	D	
6	D		D	
7	D	Other: Long sleeves and long pants. Protective eye-wear and hearing protection during drilling and as necessary. Weather gear as necessary	D	
8	D		D	

Notes:

All levels of protection must include eye, head, and foot protection.

CPC = Chemical protective clothing

PPE = Personal Protective Equipment

A = Highest level of respiratory, skin, eye, and mucous membrane protection.

B = Highest level of respiratory protection, lesser level of skin and eye protection.

C = Airborne substance known and meets criteria for air-purifying respirators. Skin and eye exposure unlikely.

D = Work uniform for nuisance contamination. Requires coveralls or dedicated work clothing, and safety shoes/boots. Other PPE based on situation.

^a Level C may be acceptable for certain tasks in some situations. If you are uncertain whether Level C is appropriate, consult the Corporate Safety Officer. Additionally, when working with unknown respiratory hazards, Level C cartridge must provide protection for organic vapors, acid gases, ammonia, amines, formaldehyde, hydrogen fluoride, and particulate aerosols.





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Monitoring Equipment: (Specify instruments needed for each task; attach additional sheets as necessary)				
Instrument	Task	Instrument Reading	Action Guideline	Comments
Combustible gas indicator model: GasTech or similar Needs to detect H2S and %oxygen	<input type="checkbox"/> 1	0 to 10% LEL	Monitor; evacuate if confined space	Burleson to monitor breathing zone during drilling. <input type="checkbox"/> Not needed
	<input type="checkbox"/> 2	10 to 25% LEL	Potential explosion hazard; notify SSC	
	<input type="checkbox"/> 3	>25% LEL	Explosion hazard; interrupt task; evacuate site; notify SSC	
	<input checked="" type="checkbox"/> 8			
Oxygen meter model:	<input type="checkbox"/> 1	>23.5% Oxygen	Potential fire hazard; evacuate site	<input checked="" type="checkbox"/> Not needed
	<input type="checkbox"/> 2	23.5 to 19.5% Oxygen	Oxygen level normal	
	<input type="checkbox"/> 3	<19.5% Oxygen	Oxygen deficiency; interrupt task; evacuate site; notify SSC	
	<input type="checkbox"/> 4			
	<input type="checkbox"/> 5			
Radiation survey meter model:	<input type="checkbox"/> 1	Normal background	Proceed	<input checked="" type="checkbox"/> Annual exposure not to exceed 1,250 mrem per quarter <input checked="" type="checkbox"/> Background reading must be taken in an area known to be free of radiation sources.
	<input type="checkbox"/> 2	Two to three times background	Notify SSC	
	<input type="checkbox"/> 3	>Three times background	Radiological hazard; interrupt task; evacuate site; notify Health Physicist	
	<input type="checkbox"/> 4			
	<input type="checkbox"/> 5			
Photoionization detector model: <input type="checkbox"/> 11.7 eV <input type="checkbox"/> 10.6 eV <input type="checkbox"/> 10.2 eV <input type="checkbox"/> 9.8 eV <input type="checkbox"/> _____ eV	<input type="checkbox"/> 1	Any response above background to 5 ppm above background	Level C* is acceptable Level B is recommended	<input checked="" type="checkbox"/> These action levels are for unknown gases or vapors. After the contaminants are identified, action levels should be based on the specific contaminants involved.
	<input type="checkbox"/> 2	> 5 to 500 ppm above background	Level B	
	<input type="checkbox"/> 3	> 500 ppm above background		
	<input type="checkbox"/> 4			
	<input type="checkbox"/> 5			
Mercury Vapor Detector	<input type="checkbox"/> 1	Any response up to the PEL (0.1 mg/m ³)	Proceed	<input checked="" type="checkbox"/> These action levels are for mercury vapor.
	<input type="checkbox"/> 2	>PEL	Implement engineering controls and reevaluate, if reading remains above the PEL respiratory protection is necessary. Stop work in this area and contact the project manager	
	<input type="checkbox"/> 3			
	<input type="checkbox"/> 4			
	<input type="checkbox"/> 5			
Particulate Meter: (needed for air monitoring during trenching, grading, and drilling)	<input checked="" type="checkbox"/> 2	Any response up to the PEL (0.1 mg/m ³ based on dust with maximum reported Hg concentration)	Proceed	<input type="checkbox"/> These action levels are for dust or are based on the concentration of known contaminants in site soil. <input checked="" type="checkbox"/> Background readings to be taken in area not affected by site activity.
	<input checked="" type="checkbox"/> 4	> background + 0.1 mg/m ³	Implement engineering controls and reevaluate, if reading remains above the PEL respiratory protection is necessary. Level C is adequate.	
	<input checked="" type="checkbox"/> 6			
	<input checked="" type="checkbox"/> 7			
	<input checked="" type="checkbox"/> 8			

Notes:

eV= electron volt

LEL=Lower explosive limit

mrem=Millirem

PEL=Permissible exposure limit

ppm=Part per million





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Site Map: Overall

Attach latest maps for detailed Corona Mine and Twin Peaks Mine components.

As appropriate for each specific activity, label the following suggested items on your maps:

1. Orientation
2. Wind direction
3. Muster Point and Evacuation route
4. Area of safe refuge
5. Exclusion zone
6. Contamination reduction zone (CRZ)
7. Support zone
8. Location(s) of hazardous materials
9. Monitoring Location(s)
10. Sampling location(s)
11. Command post





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Emergency Contacts:	Telephone No.
Napa County Emergency Response	911
U.S. Coast Guard National Response Center	(800) 424-8802
National Poison Control	(800) 222-1222
Fire department	911
Napa County Sheriff	911 or (707) 253-4509
Angwin, CA	(707) 253-4451
Burleson Consulting Inc. Personnel:	
Project Manager: Greg Reller	(916) 984-4651 ext 111
SSC: Chris Scudder	(916) 984-4651 ext 113

Medical and Site Emergencies:
Signal a site and/or medical emergency with three blasts of a loud horn (car horn, fog horn, etc.). Site personnel should evacuate to the area of safe refuge designated on the site map.
<i>Napa County provides emergency services within the site</i>
<i>Napa County Emergency – 911</i>
<i>Ambulance Telephone: 911</i>
Hospital St. Helena Hospital-Napa Valley, 10 Woodland Road, St. Helena, CA; phone (707) 963-3611
Step-by-step Routes to Hospital: (see route map)

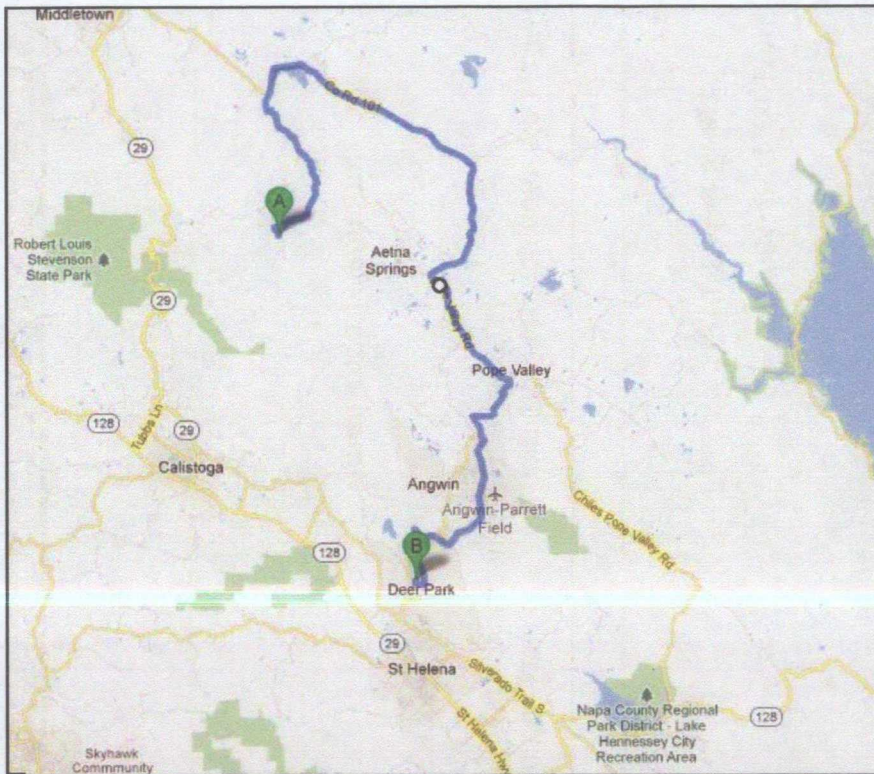
Source: EPA Standard Operating Safety Guides Publication 9285.1-03, June 1992

Note: This page must be posted on site.



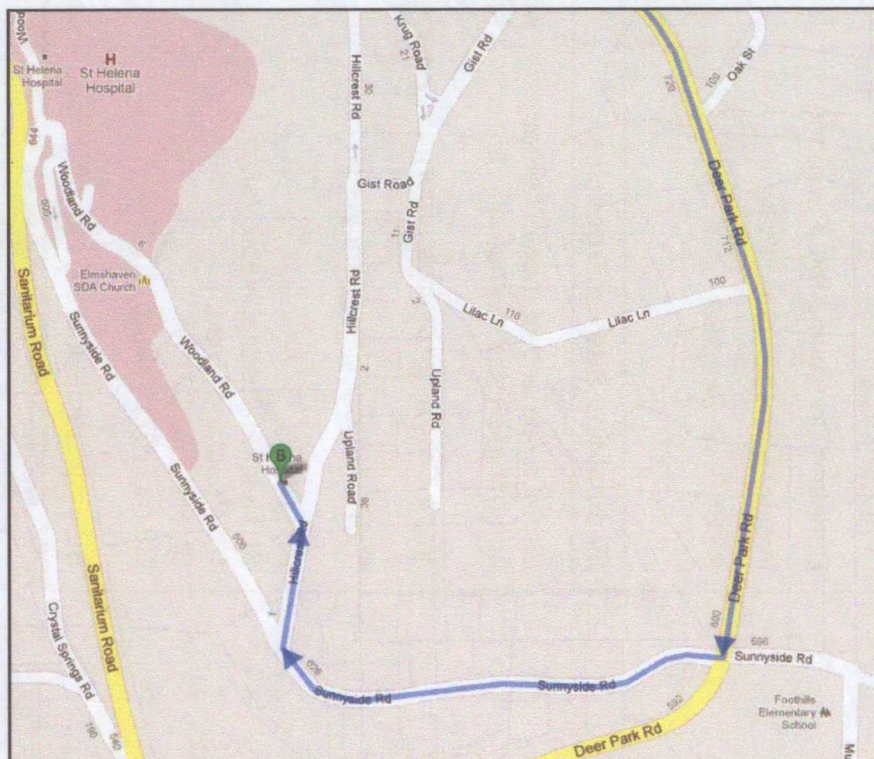
**EMERGENCY INFORMATION**

Corona and Twin Peaks Mine Sites

POST ON SITE**SAINT HELENA HOSPITAL – NAPA VALLEY, SAINT HELENA, CALIFORNIA**

From Oat Hill Road:

1. Head **northeast** on **Oat Hill Rd**
N toward **Livermore Rd-**
2. Turn right onto **Butts Canyon Rd/Co Rd 101** – Continue to follow Co Rd 101
3. Continue onto **Guenoc Rd**
4. Continue onto **Butts Canyon Rd**
5. Continue onto **Pope Valley Rd**
6. Turn right onto
Howell Mountain Rd
7. Turn right to stay on **Howell Mountain Rd**
8. At **Four Corners**, continue onto
Deer Park Rd
9. Turn right onto **Sunnyside Rd**
10. Slight right onto **Hillcrest Rd**
11. Slight left onto **Woodland Rd**
12. Arrive at 10 Woodland Rd., St. Helena, CA-Destination will be on right

28.4 mi – about 55 mins



SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

APPROVAL AND SIGN-OFF FORM

Project No.: _____

I have read, understood, and agree with the information set forth in this Health and Safety Plan and will follow the direction of the Site Safety Coordinator as well as recommended procedures and guidelines provided in this plan. I understand the training and medical requirements for conducting field work and have met these requirements

Name

Date

Name

Date

Name

Date

Name

Date

APPROVALS (Two Signatures Required):

Site Safety Coordinator

Date

Health and Safety Plan Reviewer/Approver

Date



SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

DEFINITIONS AND NOTES

Emergency Contacts

U.S. Coast Guard National Response Center - For issues related to spill containment, cleanup, and damage assessment; this hotline will direct spill information to the appropriate state or region

Limitations:

The Project HSP is not appropriate for projects involving unexploded ordnance, radiation sources as the primary hazard, or known chemical/biological weapons site must employ the Long Form HSP

Decontamination:

Decontamination Solutions for Chemical and Biological Warfare Agents^a: PPE and equipment can be decontaminated using 0.5% bleach (1 gallon laundry bleach to 9 gallons water) for biological agents (15 minutes of contact time for anthrax spores; 3 minutes for others) followed by water rinse for chemical and biological agents. In the absence of bleach, dry powders such as soap detergents, earth, and flour can be used. The powders should be applied and then wiped off using wet tissue paper. Finally, water and water/soap solutions can be used to physically remove or dilute chemical and biological agents. Do not use bleach solution on bare skin; use soap and water. Protect decon workers from exposure to bleach.

Decontamination for Radiological and Other Chemicals: For primary decontamination, staff should use Alconox and water unless otherwise specified in chemical-specific information resources. The effectiveness of radiation decontamination should be checked using a radiation survey instrument. Decontamination procedures should be repeated until the radiation meter reads less than 100 counts per minute over a 100 square centimeter area when the probe is held 1 centimeter from the surface and moving slower than 2.5 centimeters per second.

Decontamination Corridor: The decontamination set-up can be adjusted to meet the needs of the situation. The Level A decontamination set-up is included on Page 10 because it is the most complicated and critical. When compound- and site-specific information is available, the decontamination procedures can be altered to meet the needs of the specific situation.

Decontamination Waste: All disposable equipment, clothing, and decontamination solutions will be double-bagged or containerized in an acceptable manner and disposed of with investigation-derived waste.

Decontamination Personnel: Decontamination personnel should dress in the same level of PPE or one level below the entry team PPE level.

Most investigation-derived waste should be contained in trash bags and placed in regular trash. All investigation-derived waste considered to be grossly contaminated should be left on-site with the permission of the property owner. DO NOT dispose of contaminated waste until proper procedures are established.

Notes:

^a Source: Jane's Information Group. 2002. Jane's Chem-Bio Handbook. Page 39.



Attachments

Site Hazard/Activity Descriptions

MSDS for Alconox for cleaning sampling equipment

MSDS for Nitric Acid used to preserve Sample Containers

MSDS for Ethanol for subsurface chemical amendment

MSDS for sodium hydroxide for subsurface chemical amendment

MSDS for SulphoRhodamine B dye for use in tracer test

Detailed Site Maps



SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

SITE HAZARDS/ACTIVITIES

GENERAL

This section provides information on potential hazards from performing site survey and soil and water sampling activities and construction activities associated with site stabilization, revegetation, bat gate and other fence installation, infiltration trench improvements, dosing chemicals for in-situ and ex-situ treatment, pipeline installation, shallow trenching, and drilling and well installation at the Corona and Twin Peaks Mines site located in Napa County, California. Field activities and physical features of the site may expose field personnel to a variety of physical and biological hazards. The site is remote; therefore, all staff will employ the buddy system while working at the site. Two or more personnel will perform the field work, or alternatively an employee could be accompanied by another consultant or the ranch supervisor to perform the work so long as two people remain on site during field work.

Injuries resulting from physical and biological hazards can be avoided by following appropriate guidelines and employing caution. To ensure a safe workplace, each person working on site will coordinate with the Site Safety Coordinator (SSC) and document regular safety inspections and will make sure that all workers and visitors are informed of any potential physical and biological hazards related to the site.

The following guidelines are provided to ensure worker safety at the site.

GENERAL SAFE WORK PRACTICES

Site workers will follow these general safe work practices:

- Hazard assessment is a continual process; personnel must be aware of their surroundings and the chemical, physical, biological, and radiological hazards.
- Individuals will be familiar with the physical characteristics of a site including: wind direction; accessibility to associates, equipment, vehicles, and communication; areas of known or suspected contamination; site access; and water sources.
- The number of people should be limited to only those necessary to complete the work tasks in a safe and efficient manner.
- Eating, drinking, chewing tobacco, smoking, and carrying matches or lighters are prohibited in a contaminated or potentially contaminated area or where the possibility for contamination transfer exists.
- If flammable materials are to be ignited, equipment will be bonded and grounded, spark-proof, and explosion-resistant, as appropriate. Smoking and any other sources of ignition are prohibited within 50 feet of any work area and sources of flammable/combustible chemicals.
- Avoid contact with potentially contaminated substances or materials. Do not walk through stained soils, puddles, pools, or mud, or handle soils without protective clothing. Avoid, whenever possible, kneeling on the ground, leaning, or sitting on equipment or the ground. Do not place monitoring equipment on the ground or other potentially contaminated surfaces.
- Personnel are required to work using the buddy system unless specifically stated.
- All field-crew members should be alert to potentially dangerous situations, such as the presence of strong, irritating, unusual, or nauseating odors.
- Use protective equipment as specified.
- Use of heavy equipment on-site, such as backhoes, trucks, and bobcats, may be hazardous to site workers. For example, the vision of a backhoe operator is limited; therefore, all field crewmembers should stay clear when heavy equipment is operating.





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

- Wearing PPE can impair the ability to operate site equipment. Field-crew members should pay specific attention to decreased performance capabilities resulting from the use of PPE, such as poor tactile skills when wearing gloves. Prior knowledge of limitations associated with such equipment will allow the worker to assess his or her own decrease in capability to perform field operations in a safe manner.
- Wearing of jewelry, such as rings and loose bracelets and necklaces, is prohibited. Jewelry can become entangled in site machinery.
- Site personnel will perform only those tasks that they are qualified to perform.
- Site visitors are to be escorted by qualified personnel at all times.
- Running and horseplay are prohibited in all areas of the site.

PHYSICAL HAZARDS

Physical hazards that have been identified at these sites include the following:

- Driving to/from and at the site
- Slip-Trip-Fall and working and hiking in steep terrain
- Work around heavy equipment

Driving To/From the Site

The safety hazards associated with the operation of motorized equipment, including trucks and other vehicles, can be effectively controlled by the driver if a constant awareness of these hazards is maintained. All traffic regulations and rules of the road will be followed by personnel. Drivers will be alert and well rested. Use of a cell phone during driving is prohibited, drivers needing to make a phone call will park in a safe area and make the call while parked and resume driving only after the phone call is ended.

- Headlights will be turned on at all times.
- A 15 mile per hour (mph) speed limit on dirt roads at each site will be observed.

Personnel will not enter a site until Livermore Ranch personnel confirm access.

Slip-Trip-Fall Hazards

While it is difficult to prevent slip-trip-fall hazards, injuries can be prevented by proper site control measures and by keeping the work area free of obstructions. Each contractor or the SSC is responsible for monitoring the work site daily and ensuring that good housekeeping is maintained. The work surfaces and steps on equipment shall be kept clean. Materials and equipment not in use will be properly stored in a manner that does not interfere with ongoing work. Personnel will use established entry/exit points during the field activities, which will be kept clear of obstructions. Personnel will use established trails and access corridors to minimize the chance for trips and falls. Sturdy hiking boots are recommended and hiking poles are helpful.

Work Around Heavy Equipment

The hazards associated with the operation of heavy equipment can be effectively managed through adequate training and constant awareness. Consistent visual or verbal contact with the equipment operator will facilitate such awareness. All personnel working around heavy equipment will wear hard hats, safety glasses, steel-toed boots, hearing protection, and orange vests or shirts. Personnel will not approach the work area in which heavy equipment is being used without first making eye contact with the operator and verifying that the operator has seen the personnel via hand signals. In addition, personnel should keep an air-horn on site to allow instantaneous





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

communication with the equipment operator. A system of air-horn signals will be agreed upon with the equipment operator to allow rapid communication.

Working near heavy equipment can subject workers to noise exposures in excess of allowable limits. The use of ear plugs or ear muffs is mandatory when noise prevents conversation in a normal voice at a distance of 3 feet. This "rule of thumb" is an indication that noise levels may exceed the OSHA action level of 85 decibels. All personnel required to wear hearing protection, as provided by this section, shall be in a hearing conservation program in compliance with 29 CFR Section 1910.95 and 8 CCR Section 5096. When the work area is noisy or workers are wearing hearing protection, workers must be more alert to account for the decrease in communication ability.

HEAT/COLD STRESS HAZARDS

Severe heat/cold stress hazards are not anticipated for this project. Work will be scheduled around severe weather events. Work activities do not include strenuous work tasks; however, avoid over-exertion when hiking on steep grades. Employees will use appropriate weather equipment. Bring adequate water.

BIOLOGICAL HAZARDS

Biological hazards associated with site activities present a potential threat to on-site personnel. Dangers are posed by poison oak, stinging insects (bees and wasps), black widow spiders, ticks, rattlesnakes, large animals (bears and mountain lions), dehydration, and giardia.

The chance for injuries from biological hazards may be minimized by following these guidelines, and avoiding areas of reported wildlife activity. To ensure a safe workplace, the SSC may conduct and document regular safety inspections and will make sure that all workers and visitors are informed of any potential biological hazards related to the site.

Giardia

Workers should assume that all fresh water streams are infected with the giardia organism and not drink any untreated water. Workers collecting sediment and water samples from streams should wash their hands thoroughly with soap and water after collecting the samples.

Poison Oak (*R. diversiloba*)

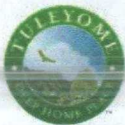
Poison oak is a shrub, climbing plant that grows up to 8 feet height, with three leaflet leaves. It is usually not found above 4,000 feet elevation. The tissues of this plant (leaves, branches, roots) contain a poisonous oil called urushiol, which is extremely irritating to the skin and causes a rash. It may be brushed onto the clothing or skin of people coming in contact with the plants, or onto pets. Contact with the plants should be avoided. After the oil has touched the skin, it usually takes some time for it to penetrate. Wash the skin thoroughly several times with plenty of soap (such as Technu) and water.

Venomous Arthropods and Snakes

Snakes and venomous arthropods, including insects, spiders, ticks, scorpions, centipedes, millipedes, and others, create a hazard when their habitats are disturbed. Wasp and bee stings account for a number of fatalities each year. In the United States, snake bites rarely cause fatalities because effective treatments have been developed. The best defense is to understand where these creatures may be found and avoid them before they can cause harm. Should a bite or sting occur, first aid should be applied immediately and medical treatment sought.

The likelihood for bites or stings can be reduced by refraining from placing hands and feet in areas that are not readily visible, by carefully inspecting the area before entering, by carefully inspecting the ground before sitting down, and by carefully inspecting objects before picking them up for examination.





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Encounters with Large Animals

Large animals that could be present at the sites include bears and mountain lions. Mountain lions may be found in the vicinity, particularly if deer are present. Bears may also be found in the region.

Large animals should be avoided to prevent worker injuries. If large animal activity is noticed or reported in an area, then the area should be avoided until such activity has stopped. The following text summarizes what to do if a bear or mountain lion is encountered.

Black Bear

- While hiking, make noise to avoid a surprise
- Never approach a bear. Give it plenty of room to pass by. Most black bears try to avoid confrontation when given a chance.
- Do not run from a bear. Running away from a black bear may stimulate its instinct to chase. You cannot outrun a bear. Instead, stand and face the animal.
- Make eye contact without staring.
- Give the bear room so that it can avoid you.
- If you encounter a bear cub, do not approach it! You run the risk of being attacked by a protective mother bear.

If a Black Bear approaches: Try to demonstrate to the bear that you may be a danger to it. Make yourself appear larger, stand up, raise your arms and open your jacket. Yell at the bear, bang pots and pans or whatever objects you may have with you, and create a general commotion.

If a Black Bear attacks: Research indicates that bear attacks have been avoided or injuries reduced when the victims fought back using any means available. Throwing rocks and striking the bear with branches or camping equipment have been shown to be effective.

Mountain Lion

Mountain lions are quiet, solitary and elusive, and typically avoid people. Mountain lion attacks on humans are extremely rare. However, conflicts are increasing as California's human population expands into mountain lion habitat.

- Avoid hiking when mountain lions are most active—dawn, dusk, and at night.
- Do not approach a mountain lion.
- If you encounter a mountain lion, do not run; instead, face the animal, make noise and try to look bigger by waving your arms; throw rocks or other objects.
- If attacked, fight back.

EXCAVATIONS

Hazards associated with excavations include: potential collapse of the sides; employees or equipment falling into excavations; damaging utilities; and exposures to site contaminants.

A "competent person" (someone knowledgeable about the hazards and authorized to implement controls) will oversee excavation activities. Protective measures such as sloping, benching, or shoring will be implemented depending on the nature of the entry and soil classification. All trenching and excavation activities will conform to the requirements of T8 CCR Sections 1539 - 1543.





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Excavation to depths greater than 5 feet requiring personnel entry are not anticipated. A permit will be obtained from Cal/OSHA (T8 CCR Section 341) before starting work on an excavation 5 feet deep or greater that personnel are required to enter.

Particulate Monitoring

Dust and airborne particulates are frequently generated during excavation and remediation activities, so inhalation of contaminants in fugitive dust or entrained soil particles represent an occupation exposure concern. A direct-reading dust monitor, such as the MiniRam or equivalent, may be used to measure particulates in the air. If elevated (visible) particulate matter conditions persist for 15 minutes or longer, the FM/SSHO is responsible for sampling the breathing zone with a particulate monitor. If dust control does not reduce dust generation, work will be temporarily stopped in affected area until monitoring equipment is obtained or until the visible dust has subsided to below the above limit.

DRILLING HAZARDS

Potential hazards associated with drilling operations include exposure to site contaminants; electrical hazards such as overhead power lines and underground utilities; rolling, spreading, or sliding tools and supplies; and rotating machinery. No drilling will be allowed within 5 feet of marked underground utilities or within 20 feet of overhead high-voltage electrical hazards. Whenever equipment operations must be performed closer than 20 feet from overhead power lines, the site safety manager must be notified.

Before the start of work, the drilling subcontractor will inspect all drilling equipment in the presence of the site safety officer. In addition to verifying that all drilling equipment is in good condition, the lead driller shall demonstrate that all safety interlock switches on the drilling equipment operate correctly. Drilling equipment inspections will be conducted at least weekly.

SPILLS OR LEAKS

If a hazardous waste spill or material release to the air, soil, or water at the site is observed, the site safety officer will notify the PM. An assessment will be made of the magnitude and potential impact of the release.

The PM will be notified immediately in the event of an emergency. The PM will immediately evaluate the incident and, if necessary, notify the appropriate emergency support services and the client. The authority to order personnel to evacuate the area rests with the PM or a qualified representative.

Transportation routes and maps will be posted in the project office and in each site vehicle prior to the initiation of on-site activities. The Emergency Notification Sheet will be posted next to the directions to the hospital. Emergency contacts, phone numbers and maps are shown at the front of this SSHSP.

Pre-planning measures to avoid personal injury or exposure include employee training, fire and explosion prevention and protection, chemical spill and discharge prevention and protection, and safe work practices. Before the start of the project, all personnel will review the project emergency response procedures including:

- Escape routes;
- Critical operations;
- Rescue/medical duties;
- Emergency reporting; and
- Emergency contacts.



SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

During any on-site emergency, work activities in the affected area will cease until the emergency is brought under control.

Qualified first aid and CPR providers will treat minor injuries on site. If additional treatment beyond first aid is required, the injured personnel will be transported to the identified emergency medical care.

SPILLS

Drummed Soil Cuttings and Decontamination Water: 1) Drums of soil cuttings generated during direct push drilling and monitoring well installation will be stored upright on a pallet in an area of low vehicle traffic to minimize the potential for an accidental release. Drums will be clearly labeled as IDW and the contents will be specified. Before handling a drum, bung lids will be checked to be sure they are tight to prevent leaks should the drum inadvertently fall or be knocked over. 2) Full drums shall be moved only by heavy equipment to minimize the risk of worker injury or of tipping the drum over.

Vehicle and Equipment Fluids: 1) Materials that may cause contamination will be present in radiators, fuel tanks, hydraulic reservoirs, fuel cans, and oil cans. Vehicles and equipment will be inspected daily and immediately taken out of service in the event of leaks. Cans containing fuels or oils will be labeled and stored appropriately. 2) Non-emergency maintenance of heavy equipment or vehicles will not be performed on site. In the event on-site equipment maintenance is required, precautions such as buckets and plastic sheeting will be used to ensure contaminants are not released to the environment.

Stock Piles: Excavated soil will be stockpiled on-site pending backfill of the excavation. Transport of these materials by wind or rain erosion poses a potential hazard to operations and nearby surface water. Erosion will be mitigated by placing the stock piles on plastic sheeting and covering with plastic sheeting. Regular inspections and maintenance of the sheeting will be conducted to ensure it is maintained in good working order. It is recommended that a temporary earthen containment berm be constructed or silt fence be installed around the perimeter of the pile.





SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

Corona and Twin Peaks Mine Sites

Material Safety Data Sheets

MSDS for Alconox for cleaning sampling equipment

MSDS for Nitric Acid used to preserve Sample Containers

MSDS for Ethanol for subsurface chemical amendment

MSDS for sodium hydroxide for subsurface chemical amendment

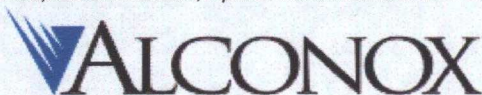
MSDS for SulphoRhodamine B dye for use in tracer test



MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations



SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **ALCONOX®**
CHEMICAL FAMILY NAME: Detergent.
PRODUCT USE: Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER: Not Applicable
U.N. DANGEROUS GOODS CLASS: Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME: Alconox, Inc.
ADDRESS: 30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE: **TOLL-FREE in USA/Canada** 800-255-3924
International calls 813-248-0585
BUSINESS PHONE: 914-948-4040
DATE OF PREPARATION: May 2011
DATE OF LAST REVISION: February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS



EUROPEAN and (GHS) Hazard Symbols



Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1

EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 207-638-8 Index# 011-005-00-2

EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breathe dust/fume/gas/mist/vapors/spray

P264: Wash hands thoroughly after handling

P271: Use only in well ventilated area.

P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

MATERIAL SAFETY DATA SHEET

ALCONOX®

Risk Phrases:

R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:

S8: Keep container dry
S22: Do not breathe dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS:

ACUTE: Eye, respiratory System, Skin

CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard JIS Z 7250: 2000.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing difficulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

MATERIAL SAFETY DATA SHEET

ALCONOX®

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT:

AUTOIGNITION TEMPERATURE:

FLAMMABLE LIMITS (in air by volume, %):

FIRE EXTINGUISHING MATERIALS:

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Explosion Sensitivity to Mechanical Impact:

Explosion Sensitivity to Static Discharge:

SPECIAL FIRE-FIGHTING PROCEDURES:

Not Flammable

Not Applicable

Lower (LEL): NA

Upper (UEL): NA

As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

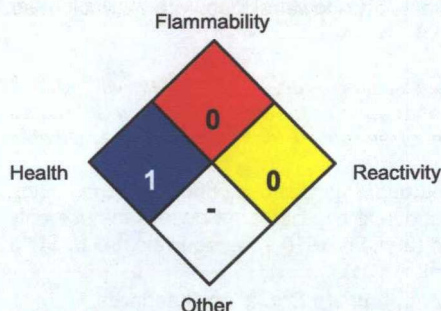
This product is non-flammable and has no known explosion hazards.

Not Sensitive.

Not Sensitive

Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD (BLUE)	1		
FLAMMABILITY HAZARD (RED)	0		
PHYSICAL HAZARD (YELLOW)	0		
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8
For Routine Industrial Use and Handling Applications			

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.

SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

MATERIAL SAFETY DATA SHEET

ALCONOX®

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m ³	5 mg/m ³	5 mg/m ³
Sodium Carbonate	497-19-8	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:

APPEARANCE & ODOR:

ODOR THRESHOLD (PPM):

VAPOR PRESSURE (mmHg):

VAPOR DENSITY (AIR=1):

BY WEIGHT:

EVAPORATION RATE (nBuAc = 1):

BOILING POINT (C°):

FREEZING POINT (C°):

pH:

SPECIFIC GRAVITY 20°C: (WATER =1)

SOLUBILITY IN WATER (%)

COEFFICIENT OF WATER/OIL DIST.:

VOC:

CHEMICAL FAMILY:

Solid

White granular powder with little or no odor.

Not Available

Not Applicable

Not Applicable.

Not Available

Not Applicable.

Not Applicable.

Not Applicable.

9.5 (1% aqueous solution)

0.85 – 1.1

>10% w/w

Not Available

None

Detergent

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SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable

DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m ³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m ³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.

SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: No Data available at this time.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Non-Regulated Material

HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable

UN IDENTIFICATION NUMBER: Not Applicable

PACKING GROUP: Not Applicable.

DOT LABEL(S) REQUIRED: Not Applicable

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable

MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:

This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:

This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):

This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:

This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

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This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory of Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

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ALCONOX®

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-in-place. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

Material Safety Data Sheet

NITRIC ACID

Print Date: February 2010

SECTION 1 – Chemical Product and Company Identification

MSDS Name: NITRIC ACID **MSDS Preparation Date:** 02-2010, Supersedes, 07-2009, 02-2008, 02-2007, 02-2004, 02-2001, 02-98

Synonyms: Aqua fortis, Azotic acid, Hydrogen nitrate, Nitryl hydroxide, Nitral, Engraver's acid

Chemical Names: DE Salpetersäure, EN nitric acid, ES ácido nítrico, FR acide nitrique, IT acido nitrico

UN / NA Number (s): UN2031

Formula: HNO₃

Molecular Wt: 63.01

Product numbers: S010101, S020101, S010101-SSNC03, S010101-SSEC03, S010101-SSNC04, S010101-SSEC04, S010101-SSNC06, S010101-SSEC06, S010101-SSNC09, S010101-SSEC09, S010101-SSNC41, S010101-SSEC41, S010101-SSNC61, S010101-SSEC61, S010101-SSNC63, S010101-SSEC63, S010101-SSNC65, S010101-SSEC65, S010101-SSND13, S010101-SSED13, S020101-SSNF01, S020101-SSEF01, S020101-SSRF01, S020101-SSNF02, S020101-SSEF02, S020101-SSRF02, S020101-SSNF03, S020101-SSEF03, S020101-SSRF03, S020101-SSNF04, S020101-SSEF04, S020101-SSRF04, S020101-SSNF05, S020101-SSEF05, S020101-SSRF05, S020101-SSNF06, S020101-SSEF06, S020101-SSRF06, S020101-SSNF07, S020101-SSEF07, S020101-SSRF07, S020101-SSNF08, S020101-SSEF08, S020101-SSRF08, S010101-SSNG04, S010101-SSEG04, S010101-SSNG09, S010101-SSEG09, S010101-SSNG41, S010101-SSEG41, S010101-SSNG61, S010101-SSEG61, S010101-SSNG65, S010101-SSEG65, S050102-SSNH11, S050103-SSNH43, S050105-SSNF02, BA-01-0250, BA-01-0500, BA-01-1000, BA-01-2000, IQ-01-0500, IQ-01-0500S, IQ-01-1000, IQ-01-1000R, IQ-01-2000, IQ-01-2000T, IQ-01-2500, IQ-01-2500-S, IQ-01-2500-6, IQ-01-2500-PVC, IQ-01-25SK, IQ-01-25SKS, IQ-01-25SK6, IQ-01-200L, CP01-2000F410, CP01-2000F620, CP01-020LPE1N, OVERFLOW-01, OVF-01-TOTE

Supplier: Seastar Chemicals Inc, 10005 McDonald Park Road, Sidney, BC V8L 5Y2 CANADA

Tel: (250) 655-5880, **Fax:** (250) 655-5888

CANUTEC (CAN): (613)-996-6666

SECTION 2 – Composition/Information on Ingredients

Chemical Name	Percent	CAS #	EINECS/ELINCS
Nitric acid	60-70%	7697-37-2	231-714-2
Water	Balance	7732-18-5	231-791-2

SECTION 3 – Hazards Identification

EMERGENCY OVERVIEW

Clear, colourless or yellowish liquid with an acid, suffocating odour. Hygroscopic. Will not burn. During a fire, nitric acid decomposes with the release of corrosive nitrogen oxide gases. Closed containers may develop pressure on prolonged exposure to heat. **STRONG OXIDIZER.** Contact with combustible and easily oxidizable materials may result in fire and/or explosion. Highly reactive. May react violently or explosively and/or ignite spontaneously with many organic and inorganic chemicals. Releases extremely flammable hydrogen gas on contact with many metals, particularly in powdered form. Generates heat when mixed with water. Nitric acid poses a very serious inhalation hazard. Symptoms of exposure include dryness of the nose and throat, cough, chest pain, shortness of breath and difficulty breathing. Causes lung injury-effects may be delayed. **CORROSIVE** to the eyes, skin and respiratory tract. Causes severe burns. May cause permanent eye injury or blindness and permanent scarring.

Potential Health Effects

Primary Route(s) of Entry: Skin contact. Eye contact. Inhalation and Ingestion.

Effects of Acute Exposure: May be fatal by ingestion, inhalation or skin absorption. Corrosive. LDLo: ORAN-human 430 mg/kg.

LD50/LC50: CAS# 7697-37-2: Inhalation, rat: LC50 = 67 ppm (NO₂)/4H. CAS# 7732-18-5: Oral, rat: LD50 = >90 mL/kg. Inhalation, rate: LC50 = 1276 ppm/1H.

Eyes: Causes severe eye burns and loss of vision. May cause permanent damage.

Skin: May cause severe skin irritation. Causes skin burns. May cause deep, penetrating ulcers of the skin.

Ingestion: Causes gastrointestinal tract burns. May cause perforation of the digestive tract. Burns in mouth, pharynx and gastrointestinal tract. Vomiting, nausea, diarrhea, abdominal pain, kidney damage and death.

Inhalation: May be fatal if inhaled. Effects may be delayed. May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Chemical pneumonitis, bronchitis, and possible death.

Effects of Chronic Exposure: Repeated inhalation may cause chronic bronchitis. Repeated exposure may cause erosion of teeth. May cause erosion of the teeth, lesions of the skin, bronchial irritation, coughing, pneumonia and lung damage. To the best of our knowledge the chronic toxicity of this substance has not been fully investigated.

SECTION 4 – First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 30 minutes, holding lids apart to ensure flushing of the entire surface. Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed.

Skin: Immediately flush skin with plenty of water for at least 20 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Get medical aid immediately. Call a physician.

Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately. Call a physician. Never give anything by mouth to an unconscious person.

Inhalation: Remove patient from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid. Call a physician.

Notes to Physician: Treat symptomatically and supportively.

SECTION 5 – Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Contact with combustible materials may cause a fire. Use water spray to keep fire-exposed containers cool. Substance is non-combustible.

Special Fire and Explosion Hazards: Oxidizing material – contributes to combustion of other materials. Emits toxic fumes under fire conditions. Contact with other materials may cause fire and/or explosion.

Extinguishing Media: Substance is non-combustible; use agent most appropriate to extinguish surrounding fire. Water spray.

Auto-ignition Temperature: N/A.

Flash Point: None.

NFPA Rating: Health 4; Flammability 0; Instability 1; Other OXIDIZING MATERIAL

Explosion Limits: Lower: Not available. Upper: Not available.

SECTION 6 – Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g., dry sand or earth), then place into a chemical waste container. Neutralize spill with sodium bicarbonate. A vapor suppressing foam may be used to reduce vapors.

Steps to be taken in case material is released or spilled: Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves. Add lime. Mix carefully with water to form a slurry place in a suitable container and send for disposal. Ventilate area and wash spill site after material pick-up is complete.

Waste disposal method: According to all applicable regulations. Avoid run-off.

SECTION 7 – Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before re-use. Use with adequate ventilation. Do not get on skin or in eyes. Do not ingest or inhale.

Storage: Store in a cool, dry, well-ventilated area away from incompatible substances, heated areas, sparks and flame. Do not store in metal or glass containers. Do not store in direct sunlight. Do not store near organic substances. Keep tightly closed. Empty container may contain hazardous residue. Do not add any other material to the container. Do not wash down the drain. Do not get in eyes, on skin, or on clothing. Wash well after use. In accordance with good storage and handling practices. Do not allow smoking or food consumption while handling.

Storage Code: White.

SECTION 8 – Exposure Control/Personal Protection

Engineering Controls: Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits

Exposure Limits:

<i>Chemical Name</i>	<i>ACGH</i>	<i>NIOSH</i>	<i>OSHA</i>
Nitric acid	2 ppm TWA; 5.2 mg/m ³ TWA; 4 ppm STEL; 10 mg/m ³ STEL	2 ppm TWA; 5 mg/m ³ TWA; 4 ppm STEL; 10 mg/m ³ STEL	2 ppm TWA; 5 mg/m ³ TWA.
Water	None listed.	None listed.	None listed.

OSHA Vacated PELs Nitric acid: 2 ppm TWA; 5 mg/m³ TWA. Nitric acid: 2 ppm TWA; 5 mg/m³ TWA

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133. Wear face shield.

Skin: Wear appropriate protective neoprene gloves to prevent skin exposure. Wear acid-resistant PVC or neoprene jacket, trousers and boots sufficient to protect skin.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respiratory Protection: Wear appropriate OSHA/MSHA approved chemical cartridge respirator. Regulations found in 29CFR 1910.134. If more than TLV, do not breathe vapour. Wear self-contained breathing apparatus. Always use an NIOSH-approved respirator when necessary.

Ventilation: Use only in a chemical fume hood. Adequate ventilation to maintain vapour/dust below TLV.

Other Protective Equipment: Make eye bath and emergency shower available.

SECTION 9 – Physical and Chemical Properties

Physical State: Liquid

Appearance: clear to yellow

Odour: strong odour – acrid odour

pH: 1.0 (0.1 M solution)

Vapour Pressure: PARTIAL PRESSURE: 70% (w/w): 0.37-0.4 kPa (2.78-3 mm Hg) at 20 °C (3,14); 0.547 kPa (4.1 mm Hg) at 25 °C

Vapour Density: 2.17 (air = 1) (calculated).

Evaporation Rate: No information available.

Viscosity: No information available.

Boiling Point: 68% (w/w): 120.5 °C (248.9 °F)

Freezing/Melting Point: 70% (w/w): -41 °C (-42 °F)

Decomposition Temperature: No information available.

Solubility: Soluble in all proportions.

Specific Gravity/Density: 68% (w/w): 1.41 g/cm³, 70% (w/w): 1.42 g/cm³

Molecular Formula: HNO₃

Molecular Weight: 63.0119

SECTION 10 – Stability and Reactivity

Chemical Stability: Decomposes when in contact with air, light, or organic matter.

Conditions to Avoid: High temperatures, incompatible materials, moisture, reducing agents.

Incompatibilities with Other Materials: Reacts with over 150 chemical combinations. Refer to NFPA Fire Protection Guide for specifics. Reacts explosively with organic materials and combustibles. Reducing agents. Reacts with most common metals to produce hydrogen. Bases, alkalis, aluminium, cyanides, iron, copper, carbides, sulphides, alcohols, hydrogen sulphide, turpentine. Heat. Amines.

Hazardous Decomposition Products: Nitrogen oxides.

Hazardous Polymerization: Will not occur. Has not been reported.

Reaction Product(s): Reacts with water to produce heat, and toxic, corrosive fumes of nitrogen oxides.

SECTION 11 – Toxicological Information

RTECS: CAS# 7697-37-2: QY5775000; QU5900000. CAS# 7732-18-5: ZC0110000.

LD50/LC50: CAS# 7697-37-2: Inhalation, rate: LC50 = 67 ppm (NO₂)/4H. CAS# 7664-39-3: Oral, rat: LD50 = >90 mL/kg.

Carcinogenicity: CAS# 7697-37-2: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA or CA Prop 65. CAS# 7732-18-5: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA or CA Prop 65.

Epidemiology: No information available.

Teratogenicity: Effects on newborn: biochemical and metabolic, Oral-rat TDLo = 2345 mg/kg (female 18D post).

Fetotoxicity: Stunted fetus, Oral-rat TDLo = 21150 mg/kg (female 1-21D post).

Reproductive: No information available.

Mutagenicity: No information available.

Neurotoxicity: No information available.

SECTION 12 – Ecological Information

Ecotoxicity: No information available. Mosquito fish: TLm = 72 /96H (fresh water). Cockle: LC50 = 330-1000 ppm/49H (salt water).

Environmental: No information reported. **Physical:** No information available **Other:** None.

SECTION 13 – Disposal Considerations

Dispose of in a manner consistent with federal, provincial/state/territorial, and local regulations.

RCRA D-Maximum Concentration of Contaminants: None of the components are on this list.

RCRA D Series – Chronic Toxicity Reference Levels: None of the components are on this list.

RCRA F Series Wastes: None of the components are on this list.

RCRA P Series Wastes: None of the components are on this list.

RCRA U Series Wastes: None of the components are on this list.

RCRA Substances Banned from Land Disposal: None of the components are on this list.

SECTION 14 – Transport Information

CANADIAN TRANSPORTATION OF DANGEROUS GOODS (TDG) SHIPPING INFORMATION

Shipping Name and Description: NITRIC ACID, other than red fuming, with not more than 70 per cent nitric acid

UN Number: UN2031 Class: 8 Packing Group/Risk Group: II

Special Provisions: --- Passenger Carrying Road/Rail Limit: Forbidden Marine Pollutant: ---

NOTE: This information incorporates the Transportation of Dangerous Goods Regulations SOR/2001-286, effective April 16, 2008.

US DEPARTMENT OF TRANSPORT (DOT) HAZARDOUS MATERIALS SHIPPING INFORMATION (49 CFR)

Shipping Name and Description: NITRIC ACID other than red fuming, with not more than 70 percent nitric acid

Hazard Class or Division: 8 (5.1) Identification Number: UN2031 Packing Group: II

NOTE: This information was taken from the US Code of Federal Regulations Title 49 - Transportation and is effective August 1, 2007.

IATA (1 January – 31 December 2009)

UN/ID No.	Proper Shipping Name / Description	Class or Div. (Sub Risk)	Hazard Label(s)	PG	EQ See 2.7	Passenger and Cargo Aircraft				Cargo Aircraft Only		S.P. See 4.4	ERG Code
						Ltd Qty		Pkg Inst	Max/Net Qty/Pkg	Pkg Inst	Max/Net Qty/Pkg		
						Pkg Inst	Max/Net Qty/Pkg						
A	B	C	D	E	F	G	H	I	J	K	L	M	N
2031	Nitric acid	8	Corrosive	II	EO	---	---	Forbidden		813	30 L		8L
	other than red fuming, with > 20% but < 65% nitric acid												
2031	Nitric acid	8 (5.1)	Corrosive	II	EO	---	---	Forbidden		813	30 L	A1	8L
	other than red fuming, with ≥ 65% but ≤ 70% nitric acid												

NOTE: Consult IATA DG Regulations for the most recent information, abbreviations and reference marks.

SECTION 15 – Regulatory Information

US OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200)

OSHA Hazard Communication Evaluation: Meets criteria for hazardous material, as defined by 29 CFR 1910.1200.

US Federal

TSCA: CAS# 7697-37-2 is listed on the TSCA Inventory. CAS# 7732-18-5 is listed on the TSCA Inventory.

Health and Safety Reporting List: None of the components are on this list.

Chemical Test Rules: None of the components are on this list.

TSCA Section 12b: None of the components are on this list.

TSCA Significant New Use Rule (SNUR): None of the components are on this list.

CERCLA Reportable Quantities (RQ): CAS# 7697-37-2: final RQ = 1000 pounds (454 kg).

SARA Threshold Planning Quantities (TPQ): CAS# 7697-37-2: TPQ = 1000 pounds.

SARA Hazard Categories: CAS# 7697-37-2: acute, chronic, flammable.

SARA Section 313: This material contains Nitric acid (CAS# 7697-38-2, 60-71%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act – Hazardous Air Pollutants (HAPs): None of the components are on this list.

Clean Air Act – Class 1 Ozone Depletors: None of the components are on this list.

Clean Air Act – Class 2 Ozone Depletors: None of the components are on this list.

Clean Water Act – Hazardous Substances: CAS# 7697-37-2 is listed as a Hazardous Substance under the CWA.

Clean Water Act – Priority Pollutants: None of the components are on this list.

Clean Water Act – Toxic Pollutants: None of the components are on this list.

OSHA – Highly Hazardous: CAS #7697-37-2 is considered highly hazardous by OSHA.

US State

State Right to Know: Nitric acid can be found on the following state Right-to-Know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

California Prop 65: No information available.

California No Significant Risk Level: No information available.

SECTION 15 – Regulatory Information - continued

CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

CCOHS WHMIS Classification:

C - Oxidizing material

E - Corrosive material

WHMIS Health Effects Criteria Met by this Chemical: E - Corrosive to skin, E - TDG class 8 - corrosive substance

WHMIS Ingredient Disclosure List: Included for disclosure at 1% or greater.

Detailed WHMIS Classification According to Criteria:

Class A - Compressed Gas: Does not meet criteria.

Class B - Flammable and Combustible Material: Does not meet criteria. Not combustible (does not burn).

Class C - Oxidizing Material: Meets criteria.

NFPA lists nitric acid (40% or less) as a Class 1 oxidizer and nitric acid (more than 40% but less than 80%) as a Class 2 oxidizer.

Nitric acid causes or contributes to the combustion of another material by yielding oxygen or other oxidizing substance.

Class D - Poisonous and Infectious Material. Division 1 - Immediate and Serious Toxic Effects: Insufficient information for classification.

Acute Lethality: Insufficient information.

Class D - Poisonous and Infectious Material. Division 2 - Other Toxic Effects: Insufficient information for classification.

See detailed evaluation below.

Chronic Health Effects: Insufficient information.

Carcinogenicity: Does not meet criteria. Not included in standard reference lists.

Teratogenicity and Embryotoxicity: Insufficient information. No human information located. The one animal study located cannot be obtained in English.

Reproductive Toxicity: Insufficient information. No human or animal information located.

Mutagenicity: Insufficient information. No human or animal studies were located.

Respiratory Tract Sensitization: Does not meet criteria. Not reported as a human respiratory sensitizer.

Skin Irritation: Corrosive materials are not also classified as irritants.

Eye Irritation: Corrosive materials are not also classified as irritants.

Skin Sensitization: Does not meet criteria. No human case reports or animal studies were located.

Class E - Corrosive Material: Meets criteria. Corrosive to animal skin, 1020 carbon steel and aluminum. TDG class 8.

Class F - Dangerously Reactive Material: Does not meet criteria.

EUROPEAN UNION (EU) CLASSIFICATION AND LABELLING INFORMATION

EU Classification: Oxidizing. Contact with combustible material may cause fire. [O;R8] Corrosive. Causes severe burns. [C;R35] (18)

EU Risk Phrases: Contact with combustible material may cause fire. Causes severe burns. [R:8-35].

EU Safety Phrases:

Keep locked up and out of the reach of children.* Do not breathe gas/fumes/vapour/spray (appropriate wording to be specified by the manufacturer). In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing. In case of accident or if you feel unwell, seek medical advice immediately (show label where possible). *This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only. [S:(1/2)*23-26-36-45].

EU Comments: NOTES RELATED TO SUBSTANCES:

The product label must indicate the percentage concentration of the solution.

CONCENTRATIONS LIMITS:

CONCENTRATIONS GREATER THAN OR EQUAL TO 20%: Corrosive; Causes severe burns. [C;R35]

CONCENTRATIONS GREATER THAN OR EQUAL TO 5% AND LESS THAN 20%: Corrosive; Causes burns. [C;R34]

Safety phrases relate to the highest concentration division indicated, but may also be applicable to lower concentrations.

Exposure Limits:

CAS# 7697-37-2; OEL-ARAB Republic of Egypt: TWA 2 ppm (5 mg/m³)

OEL-AUSTRALIA: TWA 2 ppm (5 mg/m³); STEL 4 ppm (10 mg/m³)

OEL-BELGIUM: TWA 2 ppm (5.2 mg/m³); STEL 4 ppm (10 mg/m³)

OEL-CZECHOSLOVAKIA: TWA 2.5 mg/m³; STEL 5 mg/m³

OEL-DENMARK: TWA 2 ppm (5 mg/m³)

OEL-FINLAND: TWA 2 ppm (5 mg/m³); STEL 5 ppm (13 mg/m³);

Skin

OEL-GERMANY: TWA 10 ppm (25 mg/m³)

OEL-HUNGARY: STEL 5 mg/m³

OEL-JAPAN: TWA 2 ppm (5.2 mg/m³)

OEL-THE PHILIPPINES: TWA 2 ppm (5 mg/m³)

OEL-POLAND: TWA 10 mg/m³

OEL-RUSSIA: TWA 2 ppm; STEL 2 mg/m³; Skin

OEL-SWEDEN: TWA 2 ppm (5 mg/m³); STEL 5 ppm (13 mg/m³)

OEL-SWITZERLAND: TWA 2 ppm (5 mg/m³); STEL 4 ppm (10 mg/m³)

OEL-THAILAND: TWA 2 ppm (5 mg/m³)

OEL-TURKEY: TWA 2 ppm (5 mg/m³)

OEL-UNITED KINGDOM: TWA 2 ppm (5 mg/m³); STEL 4 ppm (10 mg/m³)

OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV

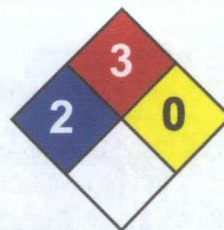
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

OES-United Kingdom: TWA 2 ppm TWA; 5 mg/m³ TWA

OES-United Kingdom: STEL 4 ppm; STEL 10 mg/m³

SECTION 16 – Other Information

The statements contained herein are offered for informational purposes only and are based upon technical data. Seastar Chemicals Inc believes them to be accurate but does not purport to be all-inclusive. The above-stated product is intended for use only by persons having the necessary technical skills and facilities for handling the product at their discretion and risk. Since conditions and manner of use are outside our control, we (Seastar Chemicals Inc) make no warranty of merchantability or any such warranty, express or implied with respect to information and we assume no liability resulting from the above product or its use. Users should make their own investigations to determine suitability of information and product for their particular purposes.



Health	2
Fire	3
Reactivity	0
Personal Protection	E

Material Safety Data Sheet

Ethyl alcohol 200 Proof MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethyl alcohol 200 Proof

Catalog Codes: SLE2248, SLE1357

CAS#: 64-17-5

RTECS: KQ6300000

TSCA: TSCA 8(b) inventory: Ethyl alcohol 200 Proof

CI#: Not applicable.

Synonym: Ethanol; Absolute Ethanol; Alcohol; Ethanol 200 proof; Ethyl Alcohol, Anhydrous; Ethanol, undenatured; Dehydrated Alcohol; Alcohol

Chemical Name: Ethyl Alcohol

Chemical Formula: CH₃CH₂OH

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethyl alcohol 200 Proof	64-17-5	100

Toxicological Data on Ingredients: Ethyl alcohol 200 Proof: ORAL (LD₅₀): Acute: 7060 mg/kg [Rat]. 3450 mg/kg [Mouse]. VAPOR (LC₅₀): Acute: 20000 ppm 8 hours [Rat]. 39000 mg/m 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified PROVEN for human. DEVELOPMENTAL TOXICITY: Classified Development toxin [PROVEN]. Classified Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE]. The substance is toxic to blood, the reproductive system, liver, upper respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 363°C (685.4°F)

Flash Points: CLOSED CUP: 12.78°C (55°F). OPEN CUP: 17.78°C (64°F) (Cleveland).

Flammable Limits: LOWER: 3.3% UPPER: 19%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of heat, of oxidizing materials, of acids.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:

Containers should be grounded. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME Vapor may travel considerable distance to source of ignition and flash back. May form explosive mixtures with air. Contact with Bromine pentafluoride is likely to cause fire or explosion. Ethanol ignites on contact with chromyl chloride. Ethanol ignites on contact with iodine heptafluoride gas. It ignites than explodes upon contact with nitrosyl perchlorate. Addition of platinum black catalyst caused ignition.

Special Remarks on Explosion Hazards:

Ethanol has an explosive reaction with the oxidized coating around potassium metal. Ethanol ignites and then explodes on contact with acetic anhydride + sodium hydrosulfate (ignites and may explode), disulfuric acid + nitric acid, phosphorous(III) oxide platinum, potassium-tert-butoxide+ acids. Ethanol forms explosive products in reaction with the following compound :

ammonia + silver nitrate (forms silver nitride and silver fulminate), iodine + phosphorus (forms ethane iodide), magnesium perchlorate (forms ethyl perchlorate), mercuric nitrate, nitric acid + silver (forms silver fulminate) silver nitrate (forms ethyl nitrate) silver(I) oxide + ammonia or hydrazine (forms silver nitride and silver fulminate), sodium (evolves hydrogen gas). Sodium Hydrazide + alcohol can produce an explosion. Alcohols should not be mixed with mercuric nitrate, as explosive mercuric fulminate may be formed. May form explosive mixture with manganese perchlorate + 2,2-dimethoxypropane. Addition of alcohols to highly concentrate hydrogen peroxide forms powerful explosives. Explodes on contact with calcium hypochlorite

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Use a respirator if the exposure limit is exceeded.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 1900 (mg/m³) from OSHA (PEL) [United States] TWA: 1000 (ppm) from OSHA (PEL) [United States] TWA: 1900 (mg/m³) from NIOSH [United States] TWA: 1000 (ppm) from NIOSH [United States] TWA: 1000 (ppm) [United Kingdom (UK)] TWA: 1920 (mg/m³) [United Kingdom (UK)] TWA: 1000 STEL: 1250 (ppm) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor:

Mild to strong, rather pleasant; like wine or whiskey. Alcohol-like; Ethereal, vinous.

Taste: Pungent. Burning.

Molecular Weight: 46.07 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 78.5°C (173.3°F)

Melting Point: -114.1°C (-173.4°F)

Critical Temperature: 243°C (469.4°F)

Specific Gravity: 0.789 (Water = 1)

Vapor Pressure: 5.7 kPa (@ 20°C)

Vapor Density: 1.59 (Air = 1)

Volatility: Not available.

Odor Threshold: 100 ppm

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.3

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:

Easily soluble in cold water, hot water. Soluble in methanol, diethyl ether, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, heat, sources of ignition.

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Ethanol rapidly absorbs moisture from the air. Can react vigorously with oxidizers. The following oxidants have been demonstrated to undergo vigorous/explosive reaction with ethanol: barium perchlorate, bromine pentafluoride, calcium hypochlorite, chloryl perchlorate, chromium trioxide, chromyl chloride, dioxygen difluoride, disulfuryl difluoride, fluorine nitrate, hydrogen peroxide, iodine heptafluoride, nitric acid nitrosyl perchlorate, perchloric acid permanganic acid, peroxodisulfuric acid, potassium dioxide, potassium perchlorate, potassium permanganate, ruthenium(VIII) oxide, silver perchlorate, silver peroxide, uranium hexafluoride, uranyl perchlorate. Ethanol reacts violently/expodes with the following compounds: acetyl bromide (evolves hydrogen bromide) acetyl chloride, aluminum, sesquibromide ethylate, ammonium hydroxide & silver oxide, chlorate, chromic anhydride, cyanuric acid + water, dichloromethane + sulfuric acid + nitrate (or) nitrite, hydrogen peroxide + sulfuric acid, iodine + methanol + mercuric oxide, manganese perchlorate + 2,2-dimethoxy propane, perchlorates, permanganates + sulfuric acid, potassium superoxide, potassium tert-butoxide, silver & nitric acid, silver perchlorate, sodium hydrazide, sulfuric acid + sodium dichromate, tetrachlorosilane + water. Ethanol is also incompatible with platinum, and sodium. No really safe conditions exist under which ethyl alcohol and chlorine oxides can be handled. Reacts vigorously with acetyl chloride

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3450 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 39000 mg/m³ 4 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified PROVEN for human. DEVELOPMENTAL TOXICITY: Classified Development toxin [PROVEN]. Classified Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE]. Causes damage to the following organs: blood, the reproductive system, liver, upper respiratory tract, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals:

Lowest Published Dose/Conc: LDL[Human] - Route: Oral; Dose: 1400 mg/kg LDL[Human child] - Route: Oral; Dose: 2000 mg/kg LDL[Rabbit] - Route: Skin; Dose: 20000 mg/kg

Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenic) Causes adverse reproductive effects and birth defects (teratogenic) , based on moderate to heavy consumption. May cause cancer based on animal data. Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans:

Acute potential health effects: Skin: causes skin irritation Eyes: causes eye irritation Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea, and alterations in gastric secretions. May affect behavior/central nervous system (central nervous system depression - amnesia, headache, muscular incoordination, excitation, mild euphoria, slurred speech, drowsiness, staggering gait, fatigue, changes in mood/personality, excessive talking, dizziness, ataxia, somnolence, coma/narcosis, hallucinations, distorted perceptions, general anesthetic), peripheral nervous system (spastic paralysis) vision (diplopia). Moderately toxic and narcotic in high concentrations. May also affect metabolism, blood, liver, respiration (dyspnea), and endocrine system. May affect respiratory tract, cardiovascular(cardiac arrhythmias, hypotension), and urinary systems. Inhalation: May cause irritation of the respiratory tract and affect behavior/central nervous system with symptoms similar to ingestion. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic reaction. Ingestion: Prolonged or repeated ingestion will have similar effects as acute ingestion. It may also affect the brain.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 14000 mg/l 96 hours [Rainbow trout]. 11200 mg/l 24 hours [fingerling trout].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification : Ethanol UNNA: 1170 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Ethyl alcohol 200 Proof (in alcoholic beverages) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Ethyl alcohol 200 Proof (in alcoholic beverages) Connecticut hazardous material survey.: Ethyl alcohol 200 Proof Illinois toxic substances disclosure to employee act: Ethyl alcohol 200 Proof Rhode Island RTK hazardous substances: Ethyl alcohol 200 Proof Pennsylvania RTK: Ethyl alcohol 200 Proof Florida: Ethyl alcohol 200 Proof Minnesota: Ethyl alcohol 200 Proof Massachusetts RTK: Ethyl alcohol 200 Proof Massachusetts spill list: Ethyl alcohol 200 Proof New Jersey: Ethyl alcohol 200 Proof Tennessee: Ethyl alcohol 200 Proof California - Directors List of Hazardous Substances (8 CCR 339): Ethyl alcohol 200 Proof TSCA 8(b) inventory: Ethyl alcohol 200 Proof

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R11- Highly flammable. S7- Keep container tightly closed. S16- Keep away from sources of ignition - No smoking.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:

-SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. HSDB, RTECS, and LOLI databases.

Other Special Considerations: Not available.

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Health	3
Fire	0
Reactivity	2
Personal Protection	J

Material Safety Data Sheet

Sodium hydroxide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium hydroxide

Catalog Codes: SLS3298, SLS1081, SLS2503, SLS3925, SLS1705

CAS#: 1310-73-2

RTECS: WB4900000

TSCA: TSCA 8(b) inventory: Sodium hydroxide

CI#: Not available.

Synonym: Caustic Soda

Chemical Name: Sodium Hydroxide

Chemical Formula: NaOH

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hydroxide	1310-73-2	100

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. **MUTAGENIC EFFECTS:** Mutagenic for mammalian somatic cells.

TERATOGENIC EFFECTS: Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to mucous membranes, upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: metals

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

Fire Fighting Media and Instructions: Not available

Special Remarks on Fire Hazards:

sodium hydroxide + zinc metal dust causes ignition of the latter. Under proper conditions of temperature, pressure and state of division, it can ignite or react violently with acetaldehyde, allyl alcohol, allyl chloride, benzene-1,4-diol, chlorine trifluoride, 1,2 dichlorethylene, nitroethane, nitromethane, nitroparaffins, nitropropane, cinnamaldehyde, 2,2-dichloro-3,3-dimethylbutane. Sodium hydroxide in contact with water may generate enough heat to ignite adjacent combustible materials. Phosphorous boiled with NaOH yields mixed phosphines which may ignite spontaneously in air. sodium hydroxide and cinnamaldehyde + heat may cause ignition. Reaction with certain metals releases flammable and explosive hydrogen gas.

Special Remarks on Explosion Hazards:

Sodium hydroxide reacts to form explosive products with ammonia + silver nitrate. Benzene extract of allyl benzenesulfonate prepared from allyl alcohol, and benzene sulfonyl chloride in presence of aqueous sodium hydroxide, under vacuum distillation, residue darkened and exploded. Sodium Hydroxide + impure tetrahydrofuran, which can contain peroxides, can

cause serious explosions. Dry mixtures of sodium hydroxide and sodium tetrahydroborate liberate hydrogen explosively at 230-270 deg. C. Sodium Hydroxide reacts with sodium salt of trichlorophenol + methyl alcohol + trichlorobenzene + heat to cause an explosion.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

Large Spill:

Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, acids, alkalis, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic. Deliquescent.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

STEL: 2 (mg/m³) from ACGIH (TLV) [United States] TWA: 2 CEIL: 2 (mg/m³) from OSHA (PEL) [United States] CEIL: 2 (mg/m³) from NIOSH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Deliquescent solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 40 g/mole

Color: White.

pH (1% soln/water): 13.5 [Basic.]
Boiling Point: 1388°C (2530.4°F)
Melting Point: 323°C (613.4°F)
Critical Temperature: Not available.
Specific Gravity: 2.13 (Water = 1)
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Volatility: Not available.
Odor Threshold: Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicity (in Water): Not available.
Dispersion Properties: See solubility in water.
Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture, moist air

Incompatibility with various substances:

Highly reactive with metals. Reactive with oxidizing agents, reducing agents, acids, alkalis, moisture.

Corrosivity: Not available.

Special Remarks on Reactivity:

Hygroscopic. Much heat is evolved when solid material is dissolved in water. Therefore cold water and caution must be used for this process. Sodium hydroxide solution and octanol + diborane during a work-up of a reaction mixture of oxime and diborane in tetrahydrofuran is very exothermic, a mild explosion being noted on one occasion. Reactive with water, acids (mineral, non-oxidizing, e.g. hydrochloric, hydrofluoric acid, muriatic acid, phosphoric), acids (mineral, oxidizing e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic e.g. acetic acid, benzoic acid, formic acid, methanoic acid, oxalic acid), aldehydes (e.g. acetaldehyde, acrolein, chloral hydrate, formaldehyde), carbamates (e.g. carbanolate, carbofuran), esters (e.g. butyl acetate, ethyl acetate, propyl formate), halogenated organics (dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene), isocyanates (e.g. methyl isocyanate), ketones (acetone, acetophenone, MEK, MIBK), acid chlorides, strong bases, strong oxidizing agents, strong reducing agents, flammable liquids, powdered metals and metals (i.e. aluminum, tin, zinc, hafnium, raney nickel), metals (alkali and alkaline e.g. cesium, potassium, sodium), metal compounds (toxic e.g. beryllium, lead acetate, nickel carbonyl, tetraethyl lead), nitrides (e.g. potassium nitride, sodium nitride), nitriles (e.g. acetonitrile, methyl cyanide), nitro compounds (organic e.g. nitrobenzene, nitromethane), acetic anhydride, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, hydrosulfuric acid, oleum, propiolactone, acrylonitrile, phosphorus pentoxide, chloroethanol, chloroform-methanol, tetrahydroborate, cyanogen azide, 1,2,4,5 tetrachlorobenzene, cinnamaldehyde. Reacts with formaldehyde hydroxide to yield formic acid, and hydrogen.

Special Remarks on Corrosivity: Very caustic to aluminum and other metals in presence of moisture.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. May cause damage to the following organs: mucous membranes, upper respiratory tract, skin, eyes.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Dose: LDL [Rabbit] - Route: Oral; Dose: 500 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material. Investigation as a mutagen (cytogenetic analysis)

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sodium hydroxide, solid UNNA: 1823 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information**Federal and State Regulations:**

Illinois toxic substances disclosure to employee act: Sodium hydroxide Illinois chemical safety act: Sodium hydroxide New York release reporting list: Sodium hydroxide Rhode Island RTK hazardous substances: Sodium hydroxide Pennsylvania RTK: Sodium hydroxide Minnesota: Sodium hydroxide Massachusetts RTK: Sodium hydroxide New Jersey: Sodium hydroxide Louisiana spill reporting: Sodium hydroxide California Director's List of Hazardous Substances: Sodium hydroxide TSCA 8(b) inventory: Sodium hydroxide CERCLA: Hazardous substances.: Sodium hydroxide: 1000 lbs. (453.6 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):

R35- Causes severe burns. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37/39- Wear suitable gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:32 PM

Last Updated: 05/21/2013 12:00 PM

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SAFETY DATA SHEET

Version 4.3

Revision Date 07/08/2014

Print Date 02/10/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Sulforhodamine B sodium salt

Product Number : S1402

Brand : Sigma

CAS-No. : 3520-42-1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H335

May cause respiratory irritation.

Precautionary statement(s)

P261

Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264

Wash skin thoroughly after handling.

P271

Use only outdoors or in a well-ventilated area.

P280

Wear protective gloves/ eye protection/ face protection.

P302 + P352

IF ON SKIN: Wash with plenty of soap and water.

P304 + P340

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P305 + P351 + P338

IF IN EYES: Rinse cautiously with water for several minutes. Remove

P312	contact lenses, if present and easy to do. Continue rinsing.
P321	Call a POISON CENTER or doctor/ physician if you feel unwell.
P332 + P313	Specific treatment (see supplemental first aid instructions on this label).
P337 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	If eye irritation persists: Get medical advice/ attention.
P403 + P233	Take off contaminated clothing and wash before reuse.
P405	Store in a well-ventilated place. Keep container tightly closed.
P501	Store locked up.
	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: $C_{27}H_{29}N_2NaO_7S_2$
Molecular Weight	: 580.65 g/mol
CAS-No.	: 3520-42-1
EC-No.	: 222-529-8

No ingredients are hazardous according to OSHA criteria.

No components need to be disclosed according to the applicable regulations.

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact

Wash off with soap and plenty of water.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, nitrogen oxides (NO_x), Sulphur oxides, Sodium oxides

5.3 Advice for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information

no data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas.

For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

General industrial hygiene practice.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

a) Appearance	Form: powder Colour: dark brown
b) Odour	no data available
c) Odour Threshold	no data available
d) pH	no data available
e) Melting point/freezing point	no data available
f) Initial boiling point and boiling range	no data available
g) Flash point	no data available
h) Evaporation rate	no data available
i) Flammability (solid, gas)	no data available
j) Upper/lower flammability or explosive limits	no data available
k) Vapour pressure	no data available
l) Vapour density	no data available
m) Relative density	no data available
n) Water solubility	no data available
o) Partition coefficient: n-octanol/water	no data available
p) Auto-ignition temperature	no data available
q) Decomposition temperature	no data available
r) Viscosity	no data available
s) Explosive properties	no data available
t) Oxidizing properties	no data available

9.2 Other safety information

no data available

10. STABILITY AND REACTIVITY**10.1 Reactivity**

no data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

no data available

- 10.4 Conditions to avoid**
no data available
- 10.5 Incompatible materials**
no data available
- 10.6 Hazardous decomposition products**
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - mouse - 10,300 mg/kg

Inhalation: no data available

Dermal: no data available

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

no data available

Germ cell mutagenicity

no data available

Hamster

fibroblast

Cytogenetic analysis

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

no data available

Specific target organ toxicity - single exposure

Inhalation - May cause respiratory irritation.

no data available

Specific target organ toxicity - repeated exposure

no data available

Aspiration hazard

no data available

Additional Information

RTECS: BP6750000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

- 12.1 Toxicity**
no data available
- 12.2 Persistence and degradability**
no data available
- 12.3 Bioaccumulative potential**
no data available
- 12.4 Mobility in soil**
no data available
- 12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted
- 12.6 Other adverse effects**
no data available

13. DISPOSAL CONSIDERATIONS

- 13.1 Waste treatment methods**
- Product**
Offer surplus and non-recyclable solutions to a licensed disposal company.
- Contaminated packaging**
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

No SARA Hazards

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Hydrogen 3,6-bis(diethylamino)-9-(2,4-disulphonatophenyl)xanthylium, sodium salt

CAS-No.
3520-42-1

Revision Date

New Jersey Right To Know Components

Hydrogen 3,6-bis(diethylamino)-9-(2,4-

CAS-No.
3520-42-1

Revision Date

disulphonatophenyl)xanthylum, sodium salt

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.3

Revision Date: 07/08/2014

Print Date: 02/10/2016



SITE SPECIFIC HSP CHECKLIST FOR SITE SURVEYS AND SAMPLING ACTIVITIES

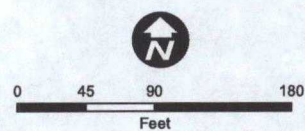
Corona and Twin Peaks Mine Sites

Detailed Site Figures





Legend				
John Livermore Property	Culvert	Future Settling Basin	BMP	Material To Be Consolidated
Roads	Existing Check Dam	Future Fence	Drainage	Consolidation Area & Revegetated
Creeks	Proposed Check Dam	Existing Trench	Pre Diversion Drainage	Revegetation
		Existing Road	Settling Basin	Mine Waste
		Timber Wall		



Corona Mine

Figure 5: Project Features

Source: Bing Maps aerial imagery
web mapping services;
Napa County GIS Department 2011;
Burleson Consulting 2011.

Burleson Consulting, Inc.



bing

Legend

- | | | |
|-----------------|-----------------------------------|-------------------------|
| — 50ft Contour | — Existing Infiltration Trench | ● Post Diversion Inlet |
| — Roads | — Settling Basin | ▲ Post Diversion Outlet |
| — Creeks | — Approximate Limit of Mine Waste | ● Adit |
| ■ Stabilization | — Pre Diversion Drainage | ● Portal |
| ■ Revegetation | — BMP | |




0 55 110 220
Feet

Twin Peaks Mine

Figure 6: Project Features

Source: Bing Maps aerial imagery
with mapping services;
Napa County GIS Department 2011;
Burleson Consulting 2012.

 Burleson Consulting, Inc.